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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. OCTOBER 5, 1899. CHICAGO, ILL. NUMBER 40

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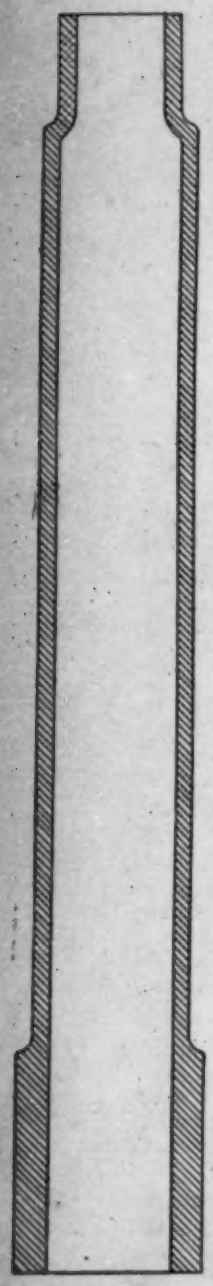

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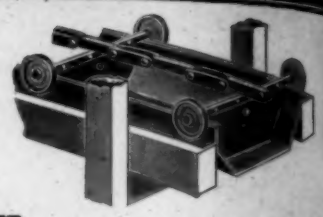

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. OCTOBER 5, 1899. CHICAGO, ILL. NUMBER 40

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The purchase of 50,000 tons of Bessemer iron in the week by the leading Western interest, added to other sales to Central Western buyers in the past 10 days, deliveries running through the first half of 1900, is additional evidence that steel manufacturers are themselves liberally sold to the middle of next year. The price was $22.50, valley furnace. When pending negotiations by other steel makers are closed, the Bessemer furnaces will be substantially sold up for six months ahead and for a very considerable portion of their output in the second quarter of next year. Another significant transaction of the week is the purchase by a pig iron selling firm of the output of a furnace yet to be started, for 1900, and enough other foundry iron to make a total of about 100,000 tons. The feeling as to the relation between the supply and the demand for foundry iron in the first half of the new year is not unanimous. There are those who still hold off, counting on the added production and the curtailing effect of high prices upon foundry operations, to give them better figures than to-day's on at least a portion of their supply between Jan. 1 and July 1, 1900. On the other hand those who are in position to know in a general way the extent of sales already made, estimate that from two-thirds to three-fourths of the probable production in that period has gone on furnace order books. Whatever the fact about sales, it is plain that the fractions given are both above the amount of foundry requirements for the first half that have been covered, reckoning that foundries will be operated next year at the rate of to-day. If 75 per cent of the output of foundry iron for the first six months of 1900 (adding in what will be back on 1899 deliveries) is now sold, the predictions of a short supply before July 1 are not so wide of the mark. But the impossibility of any approximation to accuracy in such a matter is well known, as is the difficulty of gauging the falling off in the demand for castings due to high prices. Sales of Southern iron have been of moderate volume the past week. A reported $1 advance by two interests did not actually go into effect. Its withdrawal is attributed to the unwillingness of producers to add to the tension. There is a general feeling that prices should not go higher, but the conservatives in the trade, it must be admitted have had poor success up to this time. It cannot be gainsaid that the effect of steadily rising prices upon consumption is cumulative; the only question is as to the time when it shall be so pronounced as to receive universal recognition. In the finished material end of the market there is still a hesitation to make long contracts, but each week is adding to the total of material sold for 1900, albeit buyers are more and more unwilling to pay the prices asked. The rail situation has not developed sufficiently to give a clear indication of the tonnage the railroads will place on a $33 basis. The mills, in any event, will not lack employment for some time after Jan. 1, in view of deliveries carried over by agreement. In general the indications sas to finished material are that buyers whose contracts will allow them to pay present prices seem to be numerous enough to leave little doubt as to the basis on which the bulk of the output of the mills for the first half will be sold. It is of interest to note that already inquiries have been made for Lake Superior non-Bessemer ores for 1900 and that $4 and even higher has been talked of as the basis for high-phosphorus ores for foundry mixtures.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, Oct. 4.

The market is between two fires. Although there is this week a fairly heavy inquiry for steel for next year, consumers show a disinclination to take hold at what the mills consider the proper price, while on the other hand there have been large purchases of Bessemer pig iron by steel makers, for next year, showing that they have sold finished material heavily against it, and indicating that before the balance of steel mills have covered for their requiremets still higher prices for Bessemer pig iron will have to be paid. There are prospects that Bessemer pig iron may sell at $25, Pittsburg, for next year, and with such a price steel mills are not out of the way when they feel that they should have from $38 to $40 for slabs and billets. The condition of affairs emphasizes the fact, often pointed out here, that steel billets and slabs as a market commodity are fast disappearing. It will not be long until their price in the open market will be admittedly in no definite relation with cruder or more finished products. Such is really the case at present, and the inconsistency is likely to increase rather than otherwise. In the past few months the price of steel billets has been fixed as if billets were a finished product, and not on the basis of being an intermediate form of material.

The scarcity of cars in the coke region continues, and while furnaces have been kept in blast, they are in general running on a very short supply. In some cases they have scarcely enough ahead to bank the furnace should shipments be cut off entirely. Production keeps up pretty well, but steel mills are still getting far less iron than they need, and occasional shut downs are the rule, the week often not being completed, in order to have a good supply to start with on Monday. They are about as far behind in deliveries of billets as ever.

During the week there has been, if anything, an easing up on some lines of finished material. Plates for next year are scarcely as firm as they were. Sheets, both black and galvanized, are comparatively weak. In most lines of scrap prices are off somewhat, melting stock and old rails being quotably lower.

Nearly all the foundries in the Pittsburg district are tied up by a strike of molders and core-makers, instituted last Monday morning. One or two important interests have granted the men's demands, and a few small concerns, but the prospects are that the fight will be of some duration. The foundries in general are in no condition to pay the advances asked, as they are running largely on old contracts. So far the matter has not affected the market for foundry iron, and it is not likely that it will for a time yet. The effect may possibly be to ease up a little in prices for quick delivery, which have been much higher than for next year.

PIG IRON.—There has been heavy buying of Bessemer this week. A leading Western interest purchased this week 50,000 tons of Bessemer iron in the valleys, and it is reported to have purchased another lot of 65,000 tons, making 115,000

tons in all. The purchase was made on an old option, at a price lower than could be done today. There have been other sales of considerable tonnage, the price running up as high as $23.75, but the higher prices were paid partly on account of especially prompt deliveries. For deliveries not beginning until Jan. 1 or even later, nothing below $23 25, valley, could be done, and in all probability higher prices will be paid in all future transactions. In the past four weeks the total sales of Valley and Pittsburg iron amounted to close to 150,000 tons, supplying a large part of the requirements of certain interests for the first half of next year, but there are a number of other leading producers who will still have to buy, and the prospects are that there will not be enough iron to go around. Very nearly all of the iron sold in the past four weeks has been Valley iron and there is very little Pittsburg Bessemer to come into the open market. One local furnace is to change from foundry to Bessemer in December, but its product has been largely sold for several months after the change. In foundry iron there has been a fair degree of activity, the furnaces having only odd lots to sell before July next, and prices are quotably higher for next year. For the balance of this year prices are so irregular as to be unquotable. In gray forge there has been considerable business done, up to the middle of next year, and prices are fully as strong as they were. We quote the market as follows, it being understood that for deliveries this year premiums would have to be paid in all cases:

Bessemer, valley furnace	$23.25	to	23.75
Bessemer, Pittsburg	24.00	to	24.50
No. 1 Foundry	22.50	to	23.00
No. 2 Foundry	21.75	to	22.25
No. 3 Foundry	21.00	to	21.50
Gray Forge, valley furnace	21.25	to	21.50
Gray Forge, Pittsburg	21.00	to	21.50

STEEL.—There is very little doing in billets and slabs for either this year or next. Considerable inquiry is in the market, but consumers are not ready to take hold at the prices asked. Every month witnesses a decrease in the amount of steel in the intermediate form of slabs, blooms and billets, which passes through the open market. Not only is steel allowed less often to grow cold in this form, but a greater tonnage is continually becoming the subject of transfer by private agreement between allied interests. For this year's delivery small lots of Bessemer billets have been sold at from $39 to $40 and even higher, while slabs have brought about a dollar a ton more. For next year makers feel that they should get about $38. In open-hearth steel prices are very firm at $50 for this year or next year, and we note a sale at $50.50, maker's mill, deliveries beginning this month and running into next year.

FERRO-MANGANESE.—Ferro-Manganese is very scarce. The minimum quotation is $100 for 80 per cent, and considerably higher prices have been paid in some cases.

RAILS AND TRACK MATERIAL.—There is no change in the pool price of $33 to $35 for rails. In track material there continues to be a good demand at prices quoted last week: Spikes, 2.60c to 2.75c; track bolts, square heads, 3.10c; hexagonheads, 3.25c; splice bars, 2.50c to 2.60c; links and pins, 2.70c to 2.75c.

BARS.—The market for both steel and iron bars for forward delivery continues in about the same condition as noted last week. For next year's delivery 2.50c is a minimum in steel bars, while for quick shipment 2.75c has been paid in a number of instances. We quote all muck iron bars at the same prices.

STRUCTURAL MATERIAL.—The demand for structural material continues very good, considering the season of the year. The pool prices are maintained for next year's delivery, while for anything earlier premiums are exacted except from good and regular customers. The demand at this time is coming mainly from bridge builders and for material for manufacturing plants, and bids fair to keep up all winter. As high as 2.75c has been paid for mill shipments of beams, quick delivery, and from stock better than this has been secured. We quote the regular prices as follows: Beams and channels, 3 to 15 inches, 2.25c; 18 to 24 inches, 2.35c; tees, 2.30c; zees, 2.25c; angles, 2.25c. Universal mill plates are quoted at 2.75c to 2.90c.

PLATES.—There is a little more anxiety on the part of some makers to secure tonnage for next year. For deliveries up to Jan. 1 tank plate is selling at 2.90c to 3c, while for next year we quote as follows: Tank, 2.80c; shell, 2.90c; flange, 3c to 3.10c; fire box, 3½c to 4c.

PIPES AND TUBES.—The demand keeps up well, and the mills are turning out a heavy tonnage. Prices on merchant pipe are unchanged, while the list for boiler tubes has been revised slightly. Casing is held at former prices. We quote as follows: Merchant pipe, 50 and 10 to 50 and 10 and 10, less than carloads being f. o. b. makers' mill; lap weld casing, 40 per cent off for screw and socket joint and 35 per cent off for inserted joint; boiler tubes, 1¼-inch to 1½-inch, 40 per cent off; 1¾-inch to 2½-inch, 50 per cent off for iron, and 55 per cent off for steel; 2¾-inch and larger, 52½ per cent off for iron and 55 per cent off for steel, with 5 per cent additional in carloads, less than carloads being f. o. b., mill.

SHEETS.—Both black and galvanized sheets continue lower than they should be in comparison with other lines. There is a wide range in quotations on black sheets, running all to way from 3.20c to 3.35c or even 3.40c, for No. 28 gauge, but the business is nearly all done at between 3.20c and 3.30c, for which prices reasonably prompt deliveries can be secured. In galvanized the market continues weak, and 70 and 10 and 2½ per cent off, with a freight allowance, can be done by good buyers, although some leading mills absolutely refuse to give the extra 2½ per cent.

SPELTER.—The spelter market is still weaker than at last report, and prime Western grades can be secured at 5.40c, Pittsburg.

OLD MATERIAL.—Nearly all lines of scrap are weaker than at last report, and prices are likely to settle down to a more reasonable basis. The mills in many cases are pretty well supplied for awhile. New basic scrap is still high, but is considerably below the $30 mark, at which business was done recently. Both steel and iron rails are lower, especially in the former. The market now stands about as follows, Pittsburg, gross tons, except where otherwise specified: Steel rails, mixed lengths, $19 to $20; short lengths, $20 to $21; iron rails, $26 to $27; cast borings, $11.50, net tons; cast scrap, $17.50; No. 1 wrought scrap, $19 to $20, net tons; busheling scrap, $15 to $16, net tons.

COKE.—There does not seem to be any prospect of an early let-up in the matter of car shortage. The production is about up to the requirements of the furnaces, but thousands of tons of furnace coke are lying in the region because cars cannot be secured to move it. Shipments last month aggregated 31,803 cars, or 2,811 cars less than for the month of August. There was one working day less in September, but the demand was considerably greater, calling for something like 5,000 cars more than were shipped. The furnaces in the Valley and elsewhere are experiencing a great deal of difficulty to keep going and are running from hand to mouth, but there has been no banking in the past week, as was the case two or three weeks ago. There is no coke to be purchased and prices are almost wholly nominal at $2.75 for furnace and $2.75 to $3 for foundry, for strictly Connellsville.

CHICAGO.

Office of The Iron Trade Review and Industrial World.
1522 MONADNOCK BLOCK, Oct. 4.

The week has been quiet in iron, and in steel has been a repetition of the last few weeks, with large demand and heavy sales in some lines, while in others the mills are not willing to make prices for next year, and have nothing to sell for this year. The market is strong, and while there is some talk of lower prices, it comes mostly from buyers, and does not affect the situation. The confidence of dealers in the future is exemplified by the recent purchase of a very large lot of pig iron, including the output of one furnace for 1900 by a selling firm, at current prices.

PIG IRON.—The week's sales were hardly as large as those of the two previous weeks, but were still very fair, and included several orders of good sized tonnage. The demand is heavy, and furnace agents look for future sales to be fully as large as the furnaces can take care of. Foundries in this district are all running full, and are using much more iron than ever, and even so find it difficult to keep up with the demand for castings. This is particularly true of malleable foundries. New malleable foundries and enlargements of old ones have increased the local capacity greatly within the past year, but notwithstanding this one of the largest imple-

ment concerns has lately had to use brass castings in the place of malleables because it was unable to secure enough of the latter to meet its requirements. Gray iron foundries are in almost as good shape, and altogether the output of castings for this district is very much in excess of anything previous. There are no indications that the demand upon the foundries will be smaller again, and it is a question if the tonnage of pig iron made here and allotted to this district from other manufacturing centers is sufficient to meet the demand, even with the increased production which will come when the furnaces proposed and building are finished. The market has been very strong in the week, and prices on local irons are higher than a week ago. Quotations are revised as follows:

Lake Sup. Charcoal	$24 00@$26 00	Southern Coke No. 3	$22 15@$22 65
Local Coke Fdy. No. 1	23 00@ 24 00	Southern No. 1 Soft	24 15@ 24 65
Local Coke Fdy. No. 2	22 50@ 24 00	Southern No. 2 Soft	23 15@ 23 60
Local Coke Fdy. No. 3	22 50@ 23 00	Southern Silveries	26 50@ 27 05
Local Scotch Fdy. No. 1	23 00@ 24 10	Jackson Co. Silveries	24 00@ 25 00
Local Scotch Fdy. No. 2	22 50@ 24 00	Ohio Strong Softeners	23 00@ 24 00
Local Scotch Fdy. No. 3	22 00@ 23 00	Alabama Car Wheel	25 00@ 26 00
Southern Coke No. 1	24 15@ 24 65	Malleable Bessemer	23 50@ 25 00
Southern Coke No. 2	23 15@ 23 65	Coke Bessemer	24 00@ 25 00

BARS.—Sales in the week were heavy, and included several large contracts. The demand keeps up, and appears to grow with every day. Mills are only taking business for the first six months of next year, as they are all sold for this year, and do not desire to sell beyond July, 1900. The market is firm and unchanged at 2.30c to 2.40c for common iron and 2.30c to 2.45c for soft steel, half extras.

CAR MATERIAL.—The demand has been light, and sales were only small.

STRUCTURAL MATERIAL.—The Geo. A. Fuller Co., of this city, has taken two quite large contracts for buildings in Baltimore, the steel for which was placed with the Chicago office of a Pittsburg steel company. The contract for the steel for the new palace of H. I. H., the Crown Prince of Japan, to be built at Tokio, amounting to 3,000 tons, was also placed last week, going to Pittsburg. No other important business came up. The general demand is small, and sales are not expected to be large. Prices are as follows: Beams, 15 inches and under, 2.40c; 18 inches and over, 2.50c; angles under three inches and over six inches, 2.50c; three inches to six inches, 2.40c; sheared plates, 3.15c to 3.25c; universal plates, 3.15c to 3.25c; tees, 2.45c; zees, 2.40c; small lots from store are quoted from ¼c to ½c higher.

PLATES.—The situation is still unchanged, with the mills sold up for the balance of this year, and not inclined to do business into next year. As a result of this condition orders are light. Prices are made as follows: Tank steel from store, 3.40c to 3.50c. Mill shipments, Chicago delivery: Tank steel, 3.25c; shell, 3.35c; flange, 3.40c; marine, 3.40c; fire box, 4c to 6c, according to brand.

MERCHANT PIPE.—The demand is large, with the mills not in position to take anything like the amount of business offered. Sales are mostly in small lots, but would make a good aggregate were the mills able to take all there is in sight. Prices are firm at 50 and 10 and 10 per cent discount for mill shipment.

SHEETS.—The demand is good, and quite large sales of both black and galvanized were made in the week. Black sheets are firm at 3 30c to 3.40c for No. 27, although there are some lots of sheets offered at less than these figures. They are limited in size, however. Galvanized sheet are quoted at 70 and 5 to 70 and 10 per cent off. The sheet mill consolidation, it is thought, will go through within a short time.

MERCHANT STEEL.—The demand is much larger than dealers had expected, and is above that for any previous year for this season. The higher prices do not seem to affect buyers at all. Smooth finish tire steel is quoted 2.80c to 3c; smooth finish machinery steel, 2.95c to 3.05c; spring steel, 3.65c to 3.75c; tool steel, 7c to 7.50c; special, 13 50c and upwards

BILLETS AND RODS.—The local mills have made no sales in the week, being sold up entirely until the end of the year. Business done in this territory by other mills was only small. Bessemer billets are worth about $40, and rods $50, Chicago. Sheet bars are selling in small lots at $36, Ohio mill.

RAILS AND TRACK SUPPLIES.—The local mills have closed orders for about 20,000 tons of rails in the week, and other business has been taken by mills farther East. The demand is large, and higher prices have not affected sales so far. Quotations are as follows: Rails, standard sections, $33 to $35; light sections, $34 to $40; splice bars, 2.50c to 2.70c; spikes, 2.65c to 2.75c; track bolts, 3.65c to 3.85c.

OLD MATERIAL.—The supply of almost every kind of old material is very small, and nothing like meets the demand. What small lots are offered are snapped up quickly by buyers. Prices are consequently exceedingly firm, and are advancing all the time. Selling quotations are about as follows:

Old iron rails, gross	$28 00@$30 00	Axles, net	$25 00@$26 00
Old steel rails, long, gr.	24 00@ 25 00	Cast borings, net	9 50@10 00
Old steel rails, mixed	19 00@ 19 50	Wrought turnings, net	12 00@12 50
Old wheels, gross	21 00@ 22 00	Axle turnings, net	12 50@14 00
Railroad forge, net	19 00@ 20 00	Mixed steel, gross	14 00@15 00
Dealer's forge, net	17 00@ 17 50	Stove plates, net	11 00@10 50
No. 1 mill, net	14 00@ 14 50	Heavy melting steel, gr	18 50@19 00
Heavy cast, net	16 00@ 17 00	Old iron splice b., net	21 00@22 00
Malleable cast, net	14 00@ 16 00		

WIRE AND WIRE NAILS.—The situation is about as last reported, with a heavy demand and large sales of all wire products. Buyers are somewhat anxious about future supply, as the demand appears to be in excess of productive capacity. Quotations are strong and unchanged. Makers quote single carloads of wire nails at $3.10 f. o. b. Chicago, and $3.20 less than car loads. On wire current quotations are as follows: Plain annealed wire, $2.95; painted barb wire, $3.55; galvanized barb wire, $3.70.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., Oct. 4.

The falling off in ore shipments is a very distinct feature of the situation in lake freights. There seems to have been no open rate from the head of the lake the past week, though it is reported that $1.68 was done on a small amount—the equivalent of 4¼ cents on wheat out of Duluth. In the last day or two the grain rate has advanced to 4¾c, but there is so little ore to move from the head of the lake that the market is not having the attention from ore shippers that is usual at this stage of the season. Escanaba ore remains at $1.35 to Ohio ports and $1.50 to Buffalo, with a fair amount of chartering. There is a subsidence of the talk about contracts for 1900 noted two or three weeks ago, in view of the disappearance of the $2 rate from Duluth. Some rumors concerning ore have gained currency, one to the effect that a sale of non-Bessemer had been made for 1900 at about $1.75 a ton advance over the opening price this year, but official confirmation is lacking. It is known, however, that inquiries have been made for prices on non-Bessemers, and that a basis of $4 to $4.25 has been talked of for high-phosphorus ores that early in the present season were selling at $2.25 to $2.50.

PIG IRON.—There has been an active market for Bessemer iron in the past week and sales of 75,000 tons have been made, most of it to a single large interest, at $22.50, valley furnace. Shipments for the most part are to be in the first four months of next year, though, on a part of the iron, deliveries extend to July 1. It is not likely the $22.50 price could be duplicated now and the next association sales are expected to be at least 75 cents higher, or on a $24 Pittsburg basis. Further negotiations are pending which will take up a very large part of the available Bessemer for the second quarter of 1900. The market for foundry iron continues firm, with an advancing tendency. Sales are chiefly for the first half of 1900. The announced advance of $1 in Southern iron last week was withdrawn within a day or two; the feeling of the producers making it was that such an advance would only repeat previous expereince and cause a fresh rush to cover. For small lots of iron, delivery in October or November, from $1 to $2 above the market is quoted, and $24 as a car lot price for No. 2 is reported. We quote next year's deliveries at $22 to $22.50, valley furnace. The market for forge iron is nominal at $21 to $21.50, valley. A sale of 2,000 tons at $21.75, Pittsburg, is reported, but not valley iron. We quote the Cleveland market:

Bessemer	$24 00	Valley Scotch No. 1	$23 00@23 50
No. 1 Strong Foundry	23 00@ 23 50	Valley Scotch No. 2	22 50@22 75
No. 2 Strong Foundry	22 50@ 22 75	Gray Forge, valley	21 00@21 50
No. 3 Foundry	21 50@ 22 00	Lake Superior Charcoal	24 00@25 00

FINISHED MATERIAL.—The chief factor of interest from the standpoint of tonnage is the letting of a contract for two 435-foot steel freighters. Eddy Bros., of Bay City, Mich., are the owners and the vessels will be built by the Detroit yard of the American Shipbuilding Co. Upwards of 6,000 tons of material will be required. Plates for forward delivery continue on a basis of 2.90c to 3c, Pittsburg mill for tank. Mills

are in position to take business for the first and second quarters of 1900, and the capacity added in the Pittsburg district in the past six months will yield a very material increase in production the coming year. Galvanized sheets, in view of the decline in spelter, have been easier, and certain mills are now able to give reasonably prompt deliveries. We quote 70 and 10 per cent. Black sheets show some variation in price, and on No. 27, Pittsburg quotations range from 3.10c to 3.25c. From stock, Cleveland, 3.30c is still quoted. Some business has been done with agricultural buyers the past week on plates, bars and machinery steel. The purchases are in the main for the first half of 1900. Bars are unchanged at 2.50c, Pittsburg, for round lots, and higher prices for small lot business. Bar iron is active for deliveries next year, the leading interests having made large sales to agricultural, railroad and other buyers. We continue to quote 2.15c, valley mill, with additional charges for cutting and for more than five sizes in a carload. From stock 2.50c, Cleveland, with full extras, is the market. Pipes and tubes are very strong at 50 and 10 to 50 per cent, Cleveland delivery.

Wire and Wire Nails.—With production somewhat increased, but still hard pressed by demand, we quote prices unchanged as follows, in carload lots to jobbers, f. o. b. Pittsburg mill. The retailer's price is from $2 to $3 a ton higher. Wire nails, $2.80; smooth wire, $2.65; painted barb wire, $3.25; galvanized, $3.40.

Old Material.—Considerable variations in price are still noticeable. We quote old iron rails at $25 to $27, valley mill; old steel rails, $20 to $21; No. 1 railroad wrought scrap, $20; old iron axles, $26 to $27; old car wheels, $19; machinery cast scrap, $16 to $16.50; wrought turnings, $12 to $12 50; cast borings, $11.

CINCINNATI

Oct. 3.

Matthew Addy & Co., say in their current review of the iron market: "It seems highly probable that before we reach the first of the year practically all the Southern iron that can be made during the first six months of 1900 will be sold A very large percentage has already been sold, and at the rate at which it is going it would look as if practically all of the normal output of the Southern furnaces would be contracted for by December 1st, if not sooner. Already several grades have been exhausted, that is, the furnaces have sold so much of them that it is not safe to sell another ton. The Southern furnaces are going to carry over into next year quite a tonnage which should have been delivered this year but which they have not been able to make or to ship. This statement of the case is the absolute fact and it is the most simple exposition of the strength of the market that can be made.

"Business last week was good. A heavy tonnage was placed and there were one or two exceptionally large speculative transactions. In the way of basic iron the South is particularly short. Orders are several months behind hand now and there is no prospect of relief for many months to come."

Rogers, Brown & Co. note no new phase in the market of the past week. Iron for spot delivery is exceedingly scarce and in some grades unobtainable. Car scarcity has been a great drawback. "There is a feeling on the part of manufacturers of pig iron to avoid anything like fictitious values and extravagant prices. This was shown in the conservatism of the two largest producers of pig iron in the South who had intended to advance prices $1 per ton for all grades last Monday, but, realizing that advanced prices seemed to whet the appetites of the buyers, they refrained from carrying out their program and nominally are holding to their previous schedule, though with exceedingly little iron to furnish the balance of this year, and not a great deal for the first half of next. We do not change our quotations from last week, though the figures on Southern iron vary $1 per ton on every grade. It is owing to the condition of the order books and the differing opinions of the manufacturers as to the future, all being well loaded with orders, as is generally known. The railroads running north, east and west from the Ohio river gateways have announced an advance in freight rates, effective Nov. 1, and to be determined at their meeting Oct. 5 Coke has advanced in nearly all the coke districts and has become about as scarce and difficult to supply as pig iron."

We quote for cash f. o. b. Cincinnati: Southern coke, No. 1 foundry, $21.75 to $22.75; No. 2, foundry, $20.75 to $21.75; No. 3, foundry, $19.75 to $20.75; No. 4 and gray forge, $19.25 to $20.25; No. 1 soft, $21.75 to $22.75; No. 2 soft, $20.75 to $21.75; Lake Superior coke, No. 1, $24 to $24.50; No. 2, $23 to $23.50; Hanging Rock charcoal, No. 1, $24 to $25; Jackson Co. silvery, No. 1, $30 to $31; standard Georgia car wheel, $21.75 to $22.75; Lake Superior charcoal, $25 to $25.50.

PHILADELPHIA.

Oct. 3.

There continues an enormous demand for every form of material so that prices are still at the top. The only deviation from this condition is in an occasional offer of a new brand of iron, through the starting of furnaces idle for a considerable period. In these cases neither buyer nor seller is sure of his ground and the result is quotations perhaps $1 or more below those for familiar standard brands. For No. 1X foundry upwards of $23.75 has been paid, and $23 to $23.25 has been the basis for business in No. 2X foundry, though perhaps the average of the bulk of the week's business would be nearer $22.75 for No. 2. Locally the week has not been particularly active but demand from outside points has been strong, so that furnaces do not find any let-up, all having their hands full to make deliveries on contracts. There are still cases of shortage, and their experience in this direction are leading some buyers to contract at top prices the first half of next year, though the payment of such prices may be against their judgment. In steel and in finished material it is reported foreign inquiries have come to Eastern houses recently, these including rails and railway equipment, but the trouble is to guarantee deliveries. Manufacturers in view of their belated deliveries appear indifferent to what under ordinary conditions would prove very attractive propositions. There is no relaxing of the scarcity of billets. Makers are naming $40 for the first quarter of 1900, and for early shipment $41 to $42 would probably be the basis, though transactions are not reported. The market for muck bars is easier at $32 50 to $33, maker's mill, the supply having worked more plentiful. The difficulty of placing orders for finished material continues, mills having more business offered than they can accept. Special rates are bid for October and November deliveries. The natural quieting at the close of the year may help in some lines; but the outlook generally is for continued firmness for months to come. Further advances are predicted on some materials. Old material is in great demand, with high prices offered for anything suitable for steel purposes. We quote finished material and scrap as follows: Best refined bar iron, 2.15c to 2.20c; tank plates, steel, 3c to 3.10c; angles, 2.50c to 2.75c; beams, channels and tees, 2.50c to 2.60c; sheets Nos. 10 to 14, 3c to 3.10c; Nos. 18 to 20, 3 20c to 3.30c; Nos. 21 to 27, 3.40c to 3.50c; No. 28, 3.60c to 3.70c; Choice railroad scrap, $22.50 to $23; No. 1 yard scrap, $16 to $17; No. 2 light scrap, $12 to $12.50; machinery cast, $15 to $15.50; heavy steel scrap $18 to $18.50; old iron rails, $24 to $25; old steel rails, $21 to $22; wrought turnings, $13 to $13.50; cast borings, $11.75 to $12; old car wheels, $20.50 to $21; iron axles, $26 to $28; steel axles, $25 to $27.

The contract for a steel wharf at Hong Kong recently caused close competition between American and British bidders. A leading architect of Hong Kong wrote as follows on the matter to Consul General Wildman, who has sent the information to the State Department: "American manufacturers are, as you know, cutting into British and German trade here. In some tenders we received a few weeks ago for a large steel wharf there was a difference of only £66 ($320) between the lowest tender (British) and the next lowest (American), the former being f. o. b. Liverpool, the latter f. o. b. New York. Had the price been c. i. f. here the American tender (Carnegie's) would have been the lowest, owing to freight being cheaper here from New York than from Liverpool. The wharf was let for about £7,500 ($36,450)."

The New Jersey Foundry & Machine Co., of New York City, reports having been awarded the largest contract ever placed for over-head tracking, the order calling for 24,000 feet, which will be utilized for handling meat in Manilla. The value is $18,000.

FRANKLIN INSTITUTE'S 75th ANNIVERSARY.

It was eminently fitting that the plans for the National Export Exposition, now in progress in Philadelphia, should include proper recognition of the 75th anniversary of the founding of the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts. For three-quarters of a century Franklin Institute work has been no insignificant factor in making Philadelphia so representative of the mechanical and industrial progress of the country as to become the seat of this important exposition. In the preparations for the exposition much has been contributed to its engineering features by Mr. John Birkinbine, president of the Franklin Institute, and so well known in mining and metallurgical engineering.

The present week was set aside by the officials of the National Export Expostition for appropriate exercises in the convention hall of the exposition, in celebration of the Franklin Institute's completed three-quarters of a century of resultful work in science and mechanical arts. All the evenings of the week were set apart for addresses and papers, the program being so arranged as to give an evening to each section of the Institute and Saturday evening to general commemoration. The order of the celebration and the various papers assigned for reading are indicated below:

Monday, Oct. 2, 8 p. m., the anniversary celebration, opened by the officers of the Institute. Remarks by John Birkinbine, president. Greeting by Director-General W. P. Wilson, National Export Exposition.

Chemical Section—Dr. Joseph W. Richards, Bethlehem, Pa., president of the Section, "Introductory Address." Prof. Harvey W. Wiley, Washington, D. C., "The Progress of Chemistry as Applied to the Arts." Photographic and Microscopic branch, Dr. Henry Leffmann, president. Dr. Charles F. Himes, Carlisle, Pa., "Photography and Microscopy in their Applications to the Arts."

Tuesday, Oct. 3, 8 p. m. Electrical Section—Dr. Edwin J. Houston, Philadelphia, Pa., "The Seventy-fifth Anniversary of the Franklin Institute from an Electrical Standpoint." Ralph W. Pope, New York, "The Influence of such Societies as the Franklin Institute and the American Institute of Electrical Engineers in Promoting the Progress of the Electrical Arts." Prof. F. B. Crocker, New York, "The Commercial Aspects of American Electrical Industries."

Wednesday, Oct. 4, 8 p. m. Mining and Metallurgical Section.—James Christie, Philadelphia, Pa., president of the section, "Introductory Address." Chas. Kirchhoff, New York, "Three-quarters of a Century's Progress in Mining and Metallurgy." John Fritz, Bethlehem, Pa., "The Development of Iron Manufacture during the past Seventy-five Years."

Thursday, Oct. 5, 8 p. m.—Mechanical and Engineering Section.—Wilfred Lewis, Philadelphia Pa., president of the Section, "Introductory Address." Dr. Coleman Sellers, Philadelphia, Pa., "The Progress of the Mechanical Arts in Three-quarters of a Century."

Friday, Oct. 6, 8 p. m. Physical and Astronomical Section.—Dr. A. E. Kennelly, Philadelphia, Pa., president of the section, "Introductory Address." Dr. T. C. Mendenhall, Worcester, Mass., "The Progress of Physics and Astronomy."

Saturday, Oct. 7, 8 p. m.—"Institute Day." John Birkinbine, Philadelphia, Pa., president of the Institute, "Introductory Adrdess." Rear-Admiral George W. Mellville, Engineer-in-Chief, U. S. N., "The Modern Warship as Combining in Itself the Highest Results of Skill, Ingenuity, and Scientific Knowledge." Dr. Robert H. Thurston, Ithaca, N. Y., "The Evolution of Technical Education and its Progress during the past Seventy-five Years."

At a meeting of the Northwestern Plow and Implement Association, at Chicago, Sept. 26, it was decided to make another advance of about 25 per cent above the schedule made at the meeting of the association held in July. The association adjourned to Oct. 31, when a meeting will be held for the purpose of considering a further advance.

A. Leo Weil, a Pittsburg attorney, and others, have secured an option on the plant of the Sheldon Axle Co., Wilkesbarre, Pa., and will probably purchase it.

THE SELLING SIDE OF THE TRADE.

Representatives of Well Known Iron and Steel and Equipment Firms.

Daniel L. Cobb, the representative at Chicago of the Sloss Iron & Steel Co. of Birmingham, Ala., was born and educated in Kentucky, but has spent most of his life away from his birth place. His entire business life has been spent in the

D. L. COBB.

iron business, starting with the Peekskill Iron Co., Peekskill, N. Y., where he learned the manufacture of pig iron. After two years he went to New York City, and for three years served as an apprentice in a foundry. After learning the trade thoroughly he became connected with the firm of Hugh W. Adams & Co., of New York, as a partner. This concern acted as the agents for several Northern and Southern pig iron producers, including at various times the Sloss Iron & Steel Co., and the Tennessee Coal, Iron & Railroad Co. Mr. Cobb went to Chicago in 1894, as the direct representative of the Sloss Iron & Steel Co., and has held that position ever since. His office is in the Monadnock Block.

Additional Advances in Iron and Steel Freights.

Further advances in iron and steel freights were recommended to the Trunk Line and Central Freight Association by the recent Cambridge Springs, Pa., meeting of roads particularly interested in the Pittsburg and Central Western traffic. The particular object of the meeting was to line up the new rates that go into effect Nov. 1 on a great tonnage of iron and steel articles through the abolition of the special list on these articles, putting them again under the official classification, by which fourth class rates apply on less than carload lots and fifth class rates to carloads. An additional advance on Jan. 1 was acted upon, also. The rates proposed to become effective on Jan. 1, 1900, on carload shipments of 15 gross tons are $5 per ton on billets and $4.70 on pig iron, Chicago to New York; Pittsburg to Chicago and New York, $3 per ton on billets and $2.80 on pig iron. The advance is about equal on the whole to that of July 1. The present Chicago-New York basis, is $4.90 on billets and $4.50 on pig iron, while from Pittsburg to Chicago and to New York they are $2.80 on billets and $2.50 on pig iron. It is expected that the two associations will each ratify the action of the committees and make the rates operative on the proposed date.

Export shipments of pig iron from the Birmingham, Ala., district are reported to be falling off gradually from last year's record. The recent advances in pig iron on this side have brought prices $2.50 above an exporting basis, when ocean freights are considered. For the present new export orders are not being entered by Southern producers.

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AND
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HIGH PRICES AND EXPORTS.

The effect on the export trade of steadily rising prices for iron and steel in the United States has been much discussed. On all hands it has been taken for granted that the pressure of home needs would reduce the amount of material available for export, and that the attractive home prices would lead producers to abandon to a considerable extent their foreign trade, with its smaller margins. It has been shown from time to time that advancing prices abroad have made the gap between profits on home and foreign business much smaller than might be supposed, and it has been pointed out that steel manufcturers who established agencies abroad to build up an export trade would not be so short-sighted as to let slip now what had cost so much money and effort to bring through the pioneering stages. It is impossible to say definitely how far the remarkable conditions in the iron trade at home have curtailed the total of shipments abroad that it is assumed might have been reached under relatively stable prices. In pig iron it is known that some foreign business has been declined from time to time in the past six months, and that for three months considerably fewer export orders have been booked than the average of the past two years. Billets, sheet bars and wire rods, it can be appreciated, have also fallen off in bookings. Mills have been oversold and much behind on home contracts. In wire and wire nails there has been a heavy shipment abroad, and though the prices may not have been equal to the home basis, the business has been profitable.

While it is not possible to know just how far business has been turned away, it is interesting to note that up to the end of August statistics show that there was still a good margin of gain over the record of 1898 for the first eight months. As the table below shows, the export of the products named amounted to 660,874 tons to Sept. 1 this year and 526,087 tons to Sept. 1 last year. The July total, however, was 8,000 tons less than that of July, 1898, the chief falling off being in rails; and the August total was about 2,500 tons less than that of August, 1898. At the same time August was about 3,800 tons better than July. The two months would seem to indicate that high prices were beginning to make some impression. Pig iron, bars, wire rods, billets notably, sheets and plates, and structural material show the principal shrinkage from last year:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	August.		July.	Eight months Jan.—Aug.	
	1899	1898	1899	1899	1898
Pig iron { ferro	.....	59	.....	13	3,425
Pig iron { all other	14,474	17,928	20,206	177,442	122,705
Scrap	4,497	10,064	5,727	61,681	49,447
Bar iron	1,215	688	793	8,074	3,720
Steel bars (not wire rods)	2,566	3,128	1,916	23,321	16,817
Iron rails	106	.....	340	5,260	1,350
Steel rails	29,567	22,436	18,093	159,068	196,128
Billets, ingots and blooms	92	2,891	219	24,697	17,586
Hoop, band and scroll iron	90	133	174	2,075	563
Wire rods	1,025	3,828	2,395	14,114	8,328
Iron sheets and plates	236	536	508	4,485	3,319
Steel sheets and plates	3,412	4,296	5,138	39,947	16,895
Tin plates, terne plates, and tagger's tin	22	5	18	94	13
Structural material	3,283	3,872	3,934	37,762	23,188
Wire	11,269	6,492	8,160	74,939	47,840
Cut nails	813	1,158	547	6,251	10,424
Wire nails	2,913	550	3,545	20,083	6,937
Other nails, including tacks	171	172	211	1,568	1,402
	75,751	78,236	71,927	660,874	526,087

When we take in all products of iron and steel, including machinery, and reckon by values, the record for August this year exceeds that for August last year by about 40 per cent—$10,317,447 against $7,452,522. Most of the increase is due to the advance is prices, allowing that the tonnage increase in machinery and other articles not reported by weight more than balances the decrease in the products enumerated in the above table. For the first eight months of this year the total value of all iron and steel products exported was $68,008,071, as compared with $52,925,082 to Sept. 1, 1898, and $40,757,920 to Sept. 1, 1897, a gain of 30 per cent upon last year and of 70 per cent upon 1897.

IRON MARKETS ABROAD.

We gave in our last issue extracts from market reviews of about a fortnight back, indicating the prosperous conditions in the iron and steel trade of Continental Europe. It is noteworthy that in Belgium prices are higher than since 1873, and promise still to advance. Germany reports marked scarcity of finished material and difficulty in obtaining coke and other supplies. In Great Britain, while there is a slight lull in pig iron buying and an absence of the recent fluctuations, no marked fall is likely for some time, and in finished material there is still great activity with an upward tendency.

The remarkable activity prevalent for two years in England and now greater than ever, as shown by the increase in pig iron production, has called for special comment by English journals. The London *Statist* has made itself conspicuous in this connection by predictions of a pig iron famine. The London *Iron and Coal Trades Review* shows how unfounded such a prediction is. It points out that thus far no real scarcity of pig iron has appeared and that on the West Coast, on the country, iron is going into store at the rate of 1,000 tons a week. It adds that in Scotland and Cleveland alone 450,000 tons of iron are in store and 150,000 tons in makers' hands, to fall back on at any time.

Using prices as a gauge it notes a slight decline in some pig irons and cites the general opinion that the top has been reached. As to the outlook the same paper says:

Our own belief is that if ever there was the least danger of a pig iron famine in this country it has now absolutely and wholly gone past. We are producing that material at a rate quite unexampled in our industrial history—a rate exceeding 9½ million tons a year. The stocks in warrant stores and in makers' hands for sale are alone equal to about five weeks of our present rate of consumption, so that we have a reasonable, and probably amply sufficient, margin of reserve. The pressure on pig iron makers is not so great as it was some time ago, possibly because of the material increase in make already referred to. That increase, however, is probably not by any means the last word on that subject, for a number of firms are preparing to blow in other furnaces, which must make further additions to the increase of make recorded for the first half of the year. Nor is it by any means so likely as it seemed to be a few months ago that there may be a scarcity of iron ore supplies. In the *Review* of two weeks ago Mr. Warburg described a new iron ore field of importance in Algiers which has quite recently been opened out, and which promises to become a source of supply almost of the first rank. A week earlier we published an account of another iron ore field in the Dominion of Canada, from which great things are also to be anticipated. Moreover, the development of the Swedish iron ore deposits, as we have from time to time pointed out, is proceeding at a rate and to an extent that promises very material expansion. On the whole, then, we are justified in taking a hopeful view of the situation, and believing that while there is no evidence of such a decline of demand as would affect the pig iron industry prejudicially, it seems probable that the supply will fully, and before very long, more than overtake the demand. In other words, a fairly stable equilibrium is likely to be the prevailing condition of the near future.

The feature of the situation in Germany that points to a long continuance of high prices is the approach to a coal famine that exists in the principal industrial centers. Screened bituminous coal is now selling in Germany for $2.80, or $1.20 more than the ruling price a few years back. Naturally new mines are being opened and present operations extended, with the result that the year's production of bituminous coal alone is expected to exceed 100,000,000 tons. As has been stated heretofore sales of iron and steel have been made by German manufacturers to the end of 1900 and makers of blooms, ingots and billets have been able to take care of less than 40 per cent of the demand. The stringency in semi-finished steel and to some extent in finished products has led to a proposal for the temporary removal of duties on iron and steel. No such action need be expected, and in any event little would come of it in the way of relief to German consumers. The manufacturers of other countries are too busy to take advantage of it.

Evidence accumulates that it will be a long time before the world's iron and steel stocks will again reach the tonnage that dragged upon the market in the years immediately following the Baring failure.

THE interruption of foundry operations by molders' strikes is a feature of the present situation that may become important enough to ease up the pig iron shortage promised for the last three months of the year. At Milwaukee the demand is for a minimum wage, recognition of the molders' union and a hearing by a shop committee in case of discharge. Two foundries in which this demand was presented as a test are closed and the other proprietors in that important foundry center are to receive the same demand. The suggestion of arbitration and, pending that, the resumption of work has been accepted in one case, but in general the sentiment of the men is against arbitration. At Pittsburg a demand has been made for a $3 minimum and for recognition of the union, and the shut-down is general. A core-makers' demand for a $2.75 minimum is also pending at Pittsburg and in several cases has been granted. Other strikes are on at Memphis, Tenn., Louisville, Ky., Hamilton, O., Lorain, O., and at other Western and Central Western points. The troubles in Providence and other New England foundries are still unadjusted. In the case of the Lorain Foundry Co., the men have no wage grievance and do not ask recognition of the union. Their sole grievance is that the company refuses to discharge a molder who has been in the company's employ for three years and who is unwilling to join the molders' union. For 10 days the entire working force of this shop has lost its wages because of this unjust request. It would seem that in a number of the pending strikes the men have made too many demands at once. Higher wages as prices of castigs advance is a reasonable proposition, but union recognition and supervision by union committees are very apt to encounter strenuous opposition from men who value the privilege of controlling their own business.

MAMMOTH CARNEGIE ADDITIONS.

[Special Telegram.]

PITTSBURG, PA., Oct. 4.—It is officially announced this (Wednesday) afternoon that the Carnegie Steel Co. will make some very extensive additions to its plant. They are as follows:

Two 700-ton blast furnaces at the Carrie plant, Rankin, Pa.

Fourteen 50-ton basic open hearth furnaces at the Duquesne plant.

A steel bridge across the Monongahela River for conveying hot metal from the new Carrie furnaces to the Homestead Steel Works.

A reversible blooming mill at Duquesne to roll steel from the 14 open-hearth furnaces to be built there. The product will be billets and sheet bars for the trade.

The cost of the improvements will be upwards of $6,000,000. Work will begin at once.

THE *Marine Review's* Naval Edition for 1899 is a most attractive and valuable addition to the literature of the new navy. Timed to appear in the week of Admiral Dewey's triumphal return, it recognizes the New York celebration with a special cover design that brings out the Dewey medal and the Olympia in striking relief. There are 36 pages of special illustrated articles, all prepared for this edition. One from Rear Admiral Philip Hichborn, chief of the Bureau of Construction and Repair, deals with "Our Recent Naval Program and Designs." There are letters also from Chief Engineer Melville, Chief O'Neil of the Bureau of Ordnance, and Capt. Wm. Folger, who will command the Kearsarge. Other articles, fully illustrated, are by heads of various lines of naval operations and from special Washington correspondents.

CLINTON furnace, Pittsburg, of the Clinton Iron & Steel Co., which has been on foundry iron for some time past, will be put on Bessemer in December. The product has been sold for some time.

THE WEEK IN IRON AND STEEL STOCK

Denison, Prior & Co., Garfield Bldg., Cleveland, in their weekly iron and steel letter say: "With money at 40 per cent on call, there is not very much opportunity for a bull market; yet notwithstanding the steel stocks held up very well under the pressure which was shown in Monday's market. The warlike news from the Transvaal, and rumors that actual hostilities had commenced, aided the market in its downward course, with the result that the bears had another field day. The general prosperity of the country does not warrant materially lower prices in the stock market. This money matter will soon right itself, and we have but little fear of the consequences of Great Britain's troubles in South Africa. Until these matters have adjusted themselves, probabilities are that the markets will be strictly professional, and that the fluctuations will be within narrow limits, although we look for sharp rallies in stocks that have become oversold through the prevailing style of going short of the higher priced issues.

"There have been no features in the market for the iron and steel stocks in the past week, and the probabilities are that owing to the yacht races taking many of the prominent operators off the exchange, the coming week will be as uninteresting from a market point of view as the past one has been. One noticeable thing, is the fact that but very small amounts of the preferred issues of the various steel companies have been forced upon the market during the liquidation of the past few weeks. On Monday, for instance, there was not a single sale of National Steel, preferred, and but three transactions in Tin preferred."

Fluctuations of the Week and the Year.

The following table shows the fluctuations in iron and steel stocks in the week ending with Monday, Oct. 2, and in the present year:

Name.	WEEK.				YEAR.			
	Open	High	Low	C'ose	High.		Low.	
Am. Car & Fdy	17	17	15¾	16	21⅞	May 25	15	June 15
Am. Car & Fdy pr.	64	64	61	61	68⅜	Sept. 7	56⅜	June 16
Am. Steel & Wire,.	51⅜	51⅝	4⁰½	49	72	May 4	45	Feb. 8
AmSteel & Wire pr	97	97	94¾	95	106¾	Mar. 13	92½	Feb. 8
Am. Steel Hoop.....	45	45½	42½	42½	45½	Sept. 25	24	May 24
Am. Steel Hoop pr	84½	86	84¼	85	86¾	Sept. 14	70	May 13
Am. Tin Plate,.....	39¾	39¼	37⅝	38½	52¾	April 4	33	May 24
Am. Tin Plate pr..	87	87	85⅞	86	99⅛	Feb. 8	81	June 1
Col. Fuel & Iron...	57	58½	55	55	64	Sept 11	30½	Feb. 8
Federal Steel.....	54¼	54½	51⅜	52	75	Apr. 3	46⅜	Feb. 8
Federal Steel pr....	79	79	77	77¼	93½	April 3	72½	May 13
National Steel.....	52	52	50⅛	5 ¾	63	April 24	43¾	June 2
National Steel pr .	96	96	95	96	99⅜	Aug. 11	85	May 15
Pressed Steel Car..	56½	56⅜	54⅛	55½	61	Aug. 14	44¾	June 1
PressedSteelCar pr	89⅞	90	89	89¾	91	Sept. 7	78	May 25
Republic Steel ...	28¼	28⅛	26¼	26¾	33⅜	Sept. 6	22¼	Aug. 26
Republic Steel pr..	72¾	74	70	70	79	Aug. 29	70	Oct 2
Tenn. Coal & Iron	118	118	108	111½	126	Sept 11	36	June 14

The Advance in Iron and Steel Prices.

The following table from the October *Bulletin* of the American Iron and Steel Association gives the prices of various leading articles of iron and steel and of Connellsville furnace coke in Pennsylvania, and wire nails at Chicago, on Dec. 27, 1898, on Sept. 1, 1899, and on Oct. 1, 1899. The prices named are per gross ton of 2,240 pounds, except for bar iron, nails and coke, which are quoted in lots of 100 pounds, in kegs of 100 pounds, and in net tons of 2,000 pounds, respectively. The present boom in prices in this country began in December, 1898:

Articles.	Dec. 27, 1898.	Sept 1, 1899.	Oct 1, 1899.
Old Iron T Rails, at Philadelphia.....	$13 00	$21.50	$25.00
No. 1. foundry pig iron, at Philadelphia.....	12.15	23 50	23 50
Gray forge pig iron, at Philadelphia	10 65	19.50	19.50
Gray forge pig iron, Lake Ore, at Pittsburg	9.75	20.00	21.50
Bessemer pig iron, at Pittsburg.....	10.75	23.50	24 00
Steel rails, at mills, in Pennsylvania.....	17.50	32.00	33.00
Steel billets, at mills, at Pittsburg.....	16 25	39 00	43.00
Best refined bar iron, from store, Philadelphia. Base price.....	1.25	2 30	2.50
Best refined bar iron, at Pittsburg. Base price...	1.00	2.40	2 60
Cut nails, per keg, from store, at Philadelphia. Base price.....	1.30	2 60	2 75
Wire nails, per keg, Chicago, car-load lots. Base price.....	1.42	2.95	3 10
Connellsville furnace coke.....	1 60	2.50	2 50

A 60-ton electric crane has been installed in the new machine shop of Joness & Laughlin, Ltd.

PERSONAL.

E. E. Robinson, who made the first steel in Alabama, at the old Henderson plant, 12 years ago, and who latterly has been connected with the Illinois Steel Co, has been appointed manager of the Alabama Steel & Shipbuilding Co.'s steel plant, now nearing completion at Ensley, Ala. It is expected that steel will be made early in December.

W. A. Major, who recently resigned as purchasing agent of the Sloss Iron & Steel Co., at Birmingham, Ala., to become connected with the Empire Iron & Steel Co., was given a banquet on Sept. 28 by his associates and others at Birmingham.

C. Staib, chief engineer of the locomotive works of A. Borsig, of Berlin, is in the United States, meeting iron and steel manufacturers and representatives of machine tool firms. He was in Cincinnati last week.

Samuel McDonald, who has been day superintendent of the converting department of the Ohio plant of the Nation Steel Co., at Youngstown, O., has resigned to accept a position with the Republic Iron & Steel Co. He will superintend the erection of the new steel plant at Youngstown.

Geo. Emig has resigned as superintendent of the Palmer Iron & Steel Co.'s plant at Muncie, Ind.

Ernest Vaughn, of Detroit, has been appointed assistant superintendent of the Brown-Bonnell works of the Republic Iron & Steel Co., at Youngstown, O.

John Humphrey Sessions, for many years president of the Sessions Foundry Co., Bristol Conn., died on Sept. 10, aged 71 years. He was a native of Burlington, Conn. For a generation he had been prominent in the manufacture of hardware specialties and in general foundry operations. The trunk hardware industry passes to his son John H. Sessions, Jr., whose son will be associated with him, the name John H. Sessions & Son being retained. Wm. E. Sessions, treasurer and general manager of the Sessions Foundry Co., succeeds to his father's interest in that business, which has the largest strictly foundry plant in the country.

James A. Mathews, formerly manager of the Crescent plant at Cleveland, of the American Tin Plate Co., has been transferred to the Chicago office of the company. The Crescent plant has been added to the mills in charge of District Manager Banfield.

S. J. Llewellyn, secretary of the Republic Iron & Steel Co., has just returned from a two weeks' trip to Wyoming.

Adolph Trinler, formerly superintendent of the Union Works of the Republic Iron & Steel Co., at Alexandria, Ind., has been transferred to Muncie, Ind., and is succeeded at Alexandria by W. J. Carter, formerly at the East Chicago Works.

Harold Grebst, of Gothenburg, Sweden, representing the firm of Andersson & Lindberg, iron and steel importers and exporters, is at Pittsburg. He is a delegate from Sweden to the commercial congress which is to be held in Philadelphia, and meantime is visiting the mills of the Pittsburg district.

LAUGHLIN & Co. are making contracts for the building of a new modern stack, to take the place of the second of the Eliza furnaces. The first of the furnaces to be rebuilt was blown in about a month ago, and is doing very well. The firm intends to rebuild also the third of the stacks, after the second has been completed. The additional furnace, which has been under construction for some time, will be ready for operation in December or January. When all the improvements are completed, the firm will have a line of four furnaces which will be the largest and best equipped in the world. Later on the old Soho furnace, recently purchased, may be rebuilt, but at the present time the furnace is doing excellent work and cannot be spared.

THE Frank-Kneeland Machine Co., Pittsburg, has completed shipments on the 18 sheet mills built for the National Enameling & Stamping Co., for erection at the St. Louis plant. The company is now at work on some large blowing engines for the American Steel & Wire Co.'s plant at Worcester, Mass., and the Shoenberger plant at Pittsburg.

THE Epping-Carpenter Co., Pittsburg, proposes to add a foundry to its plant in the spring, and enter the foreign market in pumps.

Review of the Technical Press.

BY DR. RICHARD MOLDENKE.

The Microstructure of Iron. [*Stahl und Eisen*, Aug. 1 and 15.]—Mr. E. Heyn, engineer of tests for the German government, gives a concise statement of the aims and methods of metallography. First there is analytical metallography which isolates the constituents of the metal or alloy, fixes the chemical and physical properties of each, and searches for the corelation between the latter and the properties of the metal as a whole. Second, what might be called synthetical metallography is the study of structural changes brought about by heat and mechanical treatment. We are still far from the goal in this comparatively new study but enough has been accomplished, especially in the line of carbons, to give rise to very sanguine expectations. All the known methods of chemical physics should be applied to metallographic work. Thus the study of magnetism, electrical conductivity, potential energy, specific gravity, specific heat, precise measurement, etc., should be drawn upon in resolving the internal make of a metal. This information would be a great aid in studying the microscopical data now available and give us important revelations about the setting of metals and alloys from their fluid condition. The study of the "set" in metals, being analogous to the crystallization from brine is called cryoscopy by Mr. Heyn. In the study of iron the well known methods of petrography are not applicable, for the thin sections thus produced would be opaque. It is therefore necessary to work with reflected light on highly polished surfaces. There is no difficulty in working with sections of the thinnest wire up to the full sized rails. The general methods of obtaining polished surfaces are now well known, but it is necessary to create a contrast of some kind to obtain an insight into the actual structure. This is accomplished by either polishing in relief (on rubber surfaces), to cut down the softer portions; etch-polishing, which colors certain of the constituents; or plain etching. In viewing the prepared surface under the objective, it may be inclined slightly to reflect the light straight upward into the microscope; the light may also be sent through a plate of glass at 45 degrees, or it may be totally reflected in the same manner through a suitable prism. The phenomena observed are sometimes very misleading, but a thorough understanding of the conditions of the polished and etched surfaces readily explains these apparent contradictions. Thus in viewing pure iron, called "ferrite" by Prof. Howe, in which the structure is made up of cubes, the shape and color of patches will naturally depend upon the way the cubes were cut. If a cube happens to be cut parallel to its face a square of even color will result. If the etching fluid has dissolved out metal enough to leave the face of the cube intact, though inclined to the plane of the section, the deepest portions will look black and the upper edge only will be bright. In this way, especially when etching with copper ammonium chloride, a very certain method of identifying the individual crystals or grains of a given surface is available. Cementite or Fe_3C is the hardest of all constituents of steel and will remain in relief where the specimen is polished on a soft bed. This cementite will remain polished even after etching and is readily distinguishable. Pearlite also stands out in relief but only half way between ferrite and cementite. It is readily isolated by its peculiar lamellar structure. Martensite, which is only found in high carbon steels, is a solution of carbon or iron carbide in the bulk of the iron. It is not as hard as cementite nor as soft as ferrite. Etching martensite usually colors it brown, but the distinguishing characteristic is its needle shaped structure in which, however, there are planes of intersection. Finally the two forms of carbon, graphite and temper carbon, can be isolated though not readily distinguished from each other.

Mr. Heyn now turns to the cryoscopic portion of metallography. All metallurgists of note have held that alloys which embrace carbon iron compounds, are really congealed solutions. Recent developments in physical chemistry have thrown light on this peculiar condition of things and naturally comparisons are interesting. Let us take a 10 per cent salt solution and cool it very slowly by artificial means. The temperature will drop steadily until at 18 degrees F. there is a peculiar retardation on the drop accompanied by the separating out of small ice crystals. At 8 degrees F. a second critical point is reached, the temperature remaining stationary while the whole solution above the deposited crystals, though still containing salt, congeals to a solid mass. After this the temperature can be made to drop still further. This interesting occurrence can be represented graphically and compared with similar curves obtained with iron, copper, etc. We find the following three points claiming our attention. The congealing of the solvent or water, the separation of the salt, and the congealing of an intimate mixture of 23.5 per cent salt with 76.5 per cent water. The first operation takes place between 3 degrees and 8 degrees F., ice forming right along and thus concentrating the salt solution. At 8 degrees F. the situation is such that a so called entectic alloy or mixture of salt and water with the percentages given above is present and congeals as an intimate mixture of salt and ice crystals. The latter process is slow, a little of the entectic mixture freezing at a time, for the water thus withdrawn supersaturates the remainder and free salt crystals drop out always, however, leaving the mother liquid in shape to deposit more of the entectic compound. Finally we have ice crystals, salt crystals, and crystals of the entectic mixture. A copper and silver alloy gives a similar curve, the entectic mixture being 28 per cent copper and 72 per cent silver. An entectic mixture, by the way, is that mixture which has the lowest melting as well as setting point of the several components. Now applying this to iron and carbon, we find the peculiar critical points after the metal has set or congealed. These critical points are not due to a freezing out of crystals from a solution but are actual and molecular changes. The curve is very similar to that of the salt solution process, however, and the operation falls within the range of 1,225 degrees to 1,850 degrees F. In cooling the alloy there is first a separation of pure iron or ferrite—corresponding to the formation of ice crystals. Then comes the separation of cementite or carbide of iron, corresponding to the crystallising out just as the salt. In the meantime the pearlite, or entectic mixture is crystallizing out just as the entectic mixture of salt and water did. This entectic mixture in the case of iron is an .80 carbon steel. Steel with less than .80 carbon must therefore consist of grains of pure iron surrounded by pearlite, at .80 carbon the whole mass will be pearlite, and above .80 carbon crystals of carbide of iron (cementite) crystallize out and are surrounded by pearlite. To follow this out let us take a .40 carbon steel, above 1,400 degrees F. This is a solution of carbon in iron called martensite. Cool it a little and grains of pure iron begin to crystallize out. The solid mother liquor remaining becomes richer in carbon and smaller in volume. When 1,250 degrees F. is reached this mass will have attained the .80 point or the entectic mixture and crystallize out as pearlite.

Now as to the applicability of the microscope to practice. Be it understood that this instrument is not to supplant the chemical and physical laboratories, but only to supplement them. Take for instance the constitution of a steel during the heating or cooling process. Only the microscope could record the radical changes. Again the temperature at which a piece of steel has been quenched is shown up by the microscope, to be of great influence upon the ultimate result, and that it is not immaterial how hot a piece was made before quenching and temper drawing. This fact bears out the contention of every tool steel maker. A piece of steel improperly treated leaves its work upon the microstructure and especially in the case of the low carbon steels is this seen in the size of the grains of pure iron. Mr. Heyn made a number of planimeter measurements to follow out this line of research with satisfactory results. The microscope is very useful in detecting enclosed slag as well as in explaining segregation phenomena. In general the separating out of ferrite and cementite can be called a segregation, though the term is usually restricted to the massing of impurities through the setting of the purer solvent. For instance the setting of the steel ingot along the edges drives inward the sulphur and phosphorus compounds The article is illustrated with a large number of photo-micrographs.

The mills of the American Steel & Wire Co., located at Anderson, Ind., resumed full operation Oct. 2. They have been idle since the middle of June.

GOVERNMENT GUN MAKING.

Through the courtesy of the *Marine Review* we are enabled to reproduce from its special Naval Edition of Sept. 28 the following description of the Government gun factory at Washington, D. C., with the two accompanying illustrations:

The ordnance factory in the Washington navy yard is worth the while of any man to visit; and while it is indeed a structure of comparatively recent founding it is one of the largest in the country. It is nearly a thousand feet long. In 1883 a bill was offered in the Senate for the establishment of a government foundry. At that time the United States had no ordnance of any kind save the old cast iron ones which were the legacies of the Civil War. In 1884 it was recommended to the Senate that guns should be made of hydraulic-forged open-hearth steel, breech-loading, chambered, of calibre ranging from 6 to 16 inches, and from 30 to 35 calibres long. The development thereafter was rapid. Today the United States possesses on its coast line 100 each 8 and 10-inch guns, nearly

FIG. 1.—GENERAL VIEW OF THE GUN SHOP AT THE WASHINGTON NAVY YARD.

50 12-inch guns (all high power steel breech-loading guns), and 200 12-inch breech-loading mortars, principally of the forged, built-up, all-steel type. The construction adopted for these guns and mortars consisted of tube, long jacket and several layers of hoops, the various elements being shrunk into place.

The struggle between the makers of guns of high pressure and the makers of impenetrable armor is still going on; and the end indeed is not yet. The largest gun in the navy, the 13-inch bore, was designed to penetrate any armor afloat, but there are so many objections to this gun that it is doubtful if any more will be built at the gun factory. It is of interest to note, however, how the big guns originated. The guns of the civil war were smooth-bore, and fired a spherical shot. Their pressure resistance was low and the powers of penetration comparatively feeble. As armor increased in toughness and thickness it became necessary to devise some means to penetrate the sides of a vessel. By elongation and pointing the projectile its power of penetration was augmented, but to keep it head on it was necessary to make a change in the gun. This was done by cutting spiral grooves in the bore of the guns, and putting projections on the projectile which engaged the grooves. Greater pressure was required in the gun, however, and to meet this severe condition the big guns were made on what is known as the "built-up" principle and of a length nearly three times that of the smooth-bore type. The working pressure of a 13-inch gun is 15 tons per square inch.

In the "built-up" gun the bore is formed by a tube of accurate uniform diameter and then several layers of hoops or bands are shrunk on by making each part somewhat smaller than the one it embraces, expanding it by heat and allowing it to cool in its place in the gun. The parts of the gun, beginning with the tube, are in a state of compression which decreases gradually outward until the outer layers are under tension. The pressure of the powder first overcomes the compression of the tube and then puts it under tensile stress, at the same time being communicated to the outer layers, each of which bears its share. The shrinkage, or original difference in diameter between a hoop and the part on which it fits, is so calculated that the tube is not compressed beyond its elastic limit, nor is the outer hoop under such tension that it will pass the limit of its elasticity.

The Manufacture of Big Guns.

The foundation of the gun is a tube of uniform exterior diameter, which contains the powder chamber and the entire bore. A large sleeve, called the jacket, of about three-fifths the length of the tube, is shrunk on the rear portion of the tube and extends sufficiently far to the rear to contain the breech mechanism. Three layers of chase hoops are shrunk

on the chase, or portion of the tube, extending from the jacket forward, and a locking band is screwed on the tube to hold the foremost chase hoop in place. The jacket is embraced by a layer of jacket hoops. The chase hoops interlock with the tube and with each other, thus preventing the forward portion of the tube from being blown apart from the rear portion. The jacket and forward jacket hoop are similarly interlocked; and a locking band is screwed over the joint between the series of chase hoops and the forward jacket hoop to lock them together, thus effectually preventing the gun from breaking through transversely.

A 13-inch gun weighs 145 000 pounds and the projectile which it fires weighs 1,100 pounds. The bore is provided with fifty-two rifling grooves, which decrease in width as they approach the muzzle. The grooves are straight forward at the rear of the bore, but gradually turn until at the muzzle they give the projectile one turn in 25 calibres. In the overhanging portion of the jacket is the screw box into which is locked the breech plug which closes the rear end of the gun. The breech plug is cylindrical in form and its surface is provided wtih a heavy screw thread. The thread is cut away in six equal spaces. The cylindrical surface of the screw box is correspondingly formed, so that in screwing the breech plug home it is necessary only to place the thread sections on the block opposite the blank spaces of the screw box and slide the breech plug clear in when a turn of one-twelfth will engage the two systems of thread and lock the breech plug in place.

The breech plug when on the screw box is supported on the plug tray, which swings on a vertical shaft secured on bearings placed on the rear end of the gun. The plug tray has a guide-way to receive one of the screw sections of the breech plug as the plug slides out of the screw box, and when the breech plug is entirely out of the gun it is locked on the tray and the latter swings on its shaft to carry the breech plug to one side. All these motions are performed simply by turning the shaft that supports the plug tray by means of a worm wheel gearing and hand crank. On the shaft below the worm wheel is a wheel which first acts (as a gear wheel) on a rack fastened on the breech plug to slide the breech plug into the screw box and then acts (as a worm wheel) on a worm rack at the end of the gear track to turn and lock the breech plug in place.

The principal parts of the gun are made from cast steel tempered in oil and carefully and repeatedly tested for tensile strength and elasticity. The hoops and jackets are cast solid and then a hole is bored through them to admit a mandrel, on which they are forged, to elongate and enlarge them. In turning the partly built-up gun to receive the next layer of hoops the gun is clamped to the face plate of the head-stock spindle and its muzzle is fitted with a plug in which is a conical hole that fits over the dead center of the tailstock at the outer end of the guides. Rests or goose-neck supports are placed at intermediate points on the guides to take part of the weight off the gun. As the gun revolves the cutting tool with its carriage is moved slowly along the guides by a large screw. In turning the outer surface of one of the jacket hoops, the tool, in going across from end to end, travels 12 miles and occupies 56 hours' time in the operation. In turning the inside of the hoop, the hoop is clamped in ring-like supports fastened on the tool carriage and the tool is secured in an arm, or a mandrel or bar, clamped to the head spindle and supported on the dead center. As the tool cannot move along the guides, the hoop is moved slowly past the tool by causing the tool carriage to move along the guides.

The outer surfaces of the tube, jacket and hoops are turned in the same manner, but the bore and inner surface of the jacket are finished by the use of boring heads or cylindrical heads having four center cutters fastened in their segments of wood, fitted in grooves in its surface, and when it is forced

FIG. 2.—LOOKING NORTH IN THE GUN SHOP AT THE WASHINGTON NAVY YARD.

into the revolving tube or jacket by the boring bar on which it is carried the wood is squeezed holding the head in the bore rigidly, compelling it to travel in a perfectly straight line while the cutter acts, thus insuring a perfect bore. So accurate is the work that the bore, although 32½ feet long, is not usually more than .002 of an inch out of a straight line.

Shrinking on the Jacket.

In assembling the gun the tube is first bored and its outer surface finished; then the jacket is finished inside and shrunk on the tube. The shrinking of a jacket is an event in the shops and usually attracts a great deal of attention. The jacket is heated to a temperature of 600 degrees Fah. in a cylindrical furnace, built in a large pit 40 feet deep. Air, blown through a tubular furnace maintained at a white heat by the combustion of sprayed crude oil, is forced through and around the jacket for 29 hours. The burning blasts of oil make a roaring that drowns voices; therefore the entire operation is directed by signals and without a word spoken. The tube has previously been placed, muzzle down, in the pit, and pipes are arranged to run water into the interior of the tube to keep it cool.

When all is ready the foreman claps his hands and motions upward. A crane, traveling on overhead tracks, raises and carries away the iron cover of the jacket heating furnace. A large crane now comes and by chains hooked to trunnions on a ring clamped to the end of the jacket, the huge jacket, 17 feet long and weighing 40,000 pounds, is raised from its casing. To see if all parts of the jacket are evenly heated to proper degree the foreman rubs the surface as it rises from the furnace with rods, composed of alloys that melt at certain known temperatures.

The jacket is now swung aside and a star-shaped gauge is thrust through its bore to see if the heat has enlarged it sufficiently to pass over the tube. The bore, if found to be correct, is cleaned out with canvas-covered swabs. The crane carries the jacket to the tube, over which the foreman by motion to the craneman, carefully centers it. Four men with asbestos gloves now steady the jacket as it slowly descends on the tube. The crane which handles the jacket can easily carry off the finished gun, and yet it possesses such delicacy that the jacket is centered within one thirty-second of an inch and is lowered at the rate of but one foot in a minute. After the jacket has cooled and shrunk on the tube, its outer surface is finished on the lathe and the hoops are shrunk on. The outer surface of each part is finished after it is in place on the gun.

The compression slope where the copper ring on the projectile enters the rifling grooves is formed by feeding in a reamer on a boring bar while the gun revolves. The reamer is a conical head, having four longitudinal cutters secured to ribs on the head. A larger brass ring on the head bears in the screw box, which, however, is not yet provided with its screw, and a smaller brass ring bears in the as yet smooth bore of the gun The cutters, acting on the shoulder between the bore of the gun and the powder chamber, cut on the revolving gun until a gradual slope connects these parts.

The next operation is the cutting of the screw threads in the screw box. The gun is as before revolved by the lathe and a tool, whose point is the shape of the space between two threads to the screw, is screwed into the carriage of the lathe, and the carriage is moved forward by its screw about 1½ inches for every revolution of the gun on its axis. This motion, causing the tool to trace aspiral in the screw box, forms the thread. The six blank spaces in the screw box are cut out by a tool that reciprocates longitudionally, the gun being slowly turned, step by step, between the movements of the tool.

In the rifling lathe the gun is locked up in line with the rifling bar and a rifling head is attached to the latter. The rifling head is cylindrical and fits the bore accurately. It carries four cutters in the shape of the rifling grooves. The rifling bar has a groove in its surface which has just the twist desired for the rifling grooves, and a stationary pin, which engages the groove in the bar, causes it and the head to turn in the proper manner to form the rifling. When four grooves are thus finished, the rifling head is turned one fifty-second of a turn and four new grooves are cut. The key way in the top of the gun is cut when the rifling is being done by a small milling machine, mounted bodily on top of the gun. In this machine a horizontally-revolving milling cutter is fed by a screw to cut the key way. The breech mechanism, which is made in a separate shop, is attached while the gun, carefully greased, lies out of doors. To avoid taking the gun into another shop, a little knock-down house is hooked together around the breech, while the mechanics, by electrically-driven tools, attach the breech mechanism.

The finished gun is placed in the sleeve of its mount and all parts of the mount are put in place or else an equivalent weight is attached. The whole mass is now raised and placed on steel wedges, supporting the large lugs on the sides of the sleeve from which the trunnions are to be formed. These lugs are made sufficiently large to allow the trunnions to be so located as to perfectly balance the gun. If the gun is accurately balanced, the power necessary to elevate and depress it is comparatively small. The wedges are tried back and forth until, when finally placed, the gun muzzle can be raised and lowered by a slight touch of the hand. The officer can calculate the position of the trunnions within one-tenth of an inch. Weighing 145,000 pounds, it is as accurate in all its parts as a high grade watch.

The naval gun factory has a capacity of turning out 3,000 projectiles per day. The United States prefers the forged-steel common shell because it will penetrate armor before exploding, whereas the cast steel shell, with thin walls but of high explosive power, is likely to explode on the outside of the armor.

Prosperity from a Western Standpoint.

Business men whose views of industrial conditions and prospects are colored by what they read of the money and stock markets in New York need occasionally to connect themselves with the West to get an adequate idea of the exceptional degree of prosperity everywhere prevalent. Reports from Western states indicate that money has not been more plentiful in a generation. Farmers are not borrowing, for they have a surplus and agents of Eastern concerns dealing in Western mortgages find their occupation gone for the time being. The *Wall Street Journal* prints a letter from a Western client of a leading Wall Street house, that gives a good idea of the situation and of its bearing on the future. We make this extract:

"I have lived in the West 30 years, and I must say that I never saw such conditions existing, as do now. For instance, I am running a smelting plant and mine, and I am paying wages from $2.50 a day to $4 a day, and I cannot get men enough here, where formerly there would be from three to five hundred men idle in this little town. I am running our smelting plant on half capacity, for the reason that I cannot get cars to bring in coke. Coke is $2 a ton higher, and I can't get it at that. Steel rails for our mines, two years ago, were bought for $20 in Chicago, but today I can't get them for prompt delivery for $40; that is for only 12-pound rails. Everything else is in proportion. If I order a piece of casting, I can't get it for 14 months, and I don't see how this is going to stop for a long time to come. The crops are good and farmers have plenty of money and cattle men are getting rich. I sold 7,000 head of cattle this year, and they netted me $14 per head more than they did last year and $19 more than they did two years ago. All of these things are going to count in the long run. I do not see anything to encourage the bears, if prosperity counts for anything. I think you will see the market higher than it has ever been before."

Alfred Dimmack, of Wheeling, W. Va., dealer in wrought and cast scrap iron and other forms of old material, has yards on the South Side, 200 feet on the B. & O. Railroad, 50 feet on Main street and 25 feet on Market street. A B. & O. switch runs close to the entrance to the yard on Main street, so that cars may be very conveniently loaded and unloaded. A 25-horse power engine operates two shears and a larger shear for the cutting of old rails and other heavier material. A steam hammer is employed also to put casing and other ill-shaped material in shape for convenient shearing. All material is carefully graded to meet the requirements of various mills. Mr. Dimmack has conducted the business at the same yard for 20 years. He is assisted by two sons, Benjamin and Matthew.

MULTIPLE DRILLING MACHINE.

The Hoefer Mfg. Co., of Freeport, Ill., successors to the Stover Novelty Works, manufactures an adjustable multiple drilling machine, originally designed to drill round or flat bars or tubing, but so arrangd that a variety of work can be drilled by making slight changes in the table. As it appears in the illustration the tool has an adjustment of 14 feet between centers of outside drills, and a minimum adjustment of 4 inches—closer, if necessary. The drill shown has 10 spindles, the one at the middle point being a twin spindle 1⅜-inch between centers. Any number of spindles up to 16 may be attached.

The driving shaft has a groove its entire length. The bevel gears are fitted with keys and set-screws and can be moved and locked in any position, and the spindle heads being gibbed on the cross head of the main frame, will admit of moving horizontally from one end of the machine to the other, and firmly locked at any desired point by a single gib screw. These heads are supplied with boxes for the main shaft to follow up on the shaft, supporting it at every gear.

The cone pulleys have a 3-step cone on the driving shaft and a 4-step cone on the feet shaft, giving a large variety of speeds. The spindles are driven by bevel pinions supplied with 8-inch bearing in which the upper end of the spindles are keyed and feathered. The lower end of the spindles has a chambered sleeve 10 inches long, clamped in 6-inch boxes, giving an independent vertical adjustment of 7 inches. This will provide for evening up the points of the drills. Between the lower end of these sleeves and the spindle heads are hardened steel collars, and ball bearings, reducing the friction to a minimum. The spindles above the sleeves are fitted with collars and lock nuts to take up wear.

The table, which is counterbalanced by weight, is gibbed to specially long guides on the five standards, as shown in the cut, and has a vertical feed of four inches or more if desired. Below the table are five worm gears, back of which are an equal number of feeding cams. On the lower edge of the table are attached five steel rollers, which travel on these elevating cams, as they are driven by the gears. The worm gears, to which the cams are keyed, are driven by worms on the shaft below the gears, and as the cams increase their height the table with the work is fed up to the drills; and when fed to its highest point, the cams have a quick return, lower the table with the least possible loss of time, and when at its lowest point, the feed is automatically stopped. To start the feed, a lever, to the right of the machine in convenient reach is drawn forward and engages the clutch. All gears are cut from blanks.

The greatest height of the drill is 76 inches, and the greatest distance from the spindle to the floor is 46 inches, and the greatest distance from the table to the spindle, 14 inches. The vertical feed of the table is 4 inches and the vertical adjustment of the spindle 7 inches.

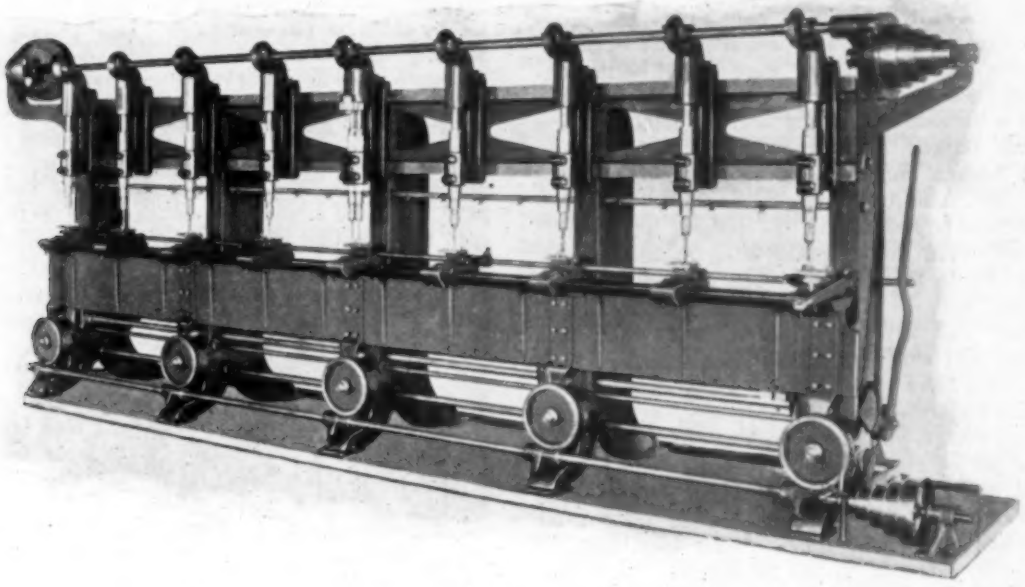

FIG. 1.—10-SPINDLE DRILLING MACHINE.

Steam Shovel Work on the Mesabi Range.

By far the best and cheapest of the several mining methods in use in the Lake Superior region is that by open-cut with steam shovels. This has so far proved applicable only to five mines, which are all in the Mesabi district, viz., the Mountain Iron, Oliver, Ohio, Mahoning and Biwabik mines. The physical condition of the ore here resembles earth rather than rock. It lies on the slopes of the hills in immense masses with little soil above it. The steam shovels used have three separate pairs of cylinders and one boiler. They weigh 92 tons, and are carried on four axles. One machine has filled 232 25-ton ore cars, or a total of 5,825 tons, in nine hours, but this is a record performance. Five tons of ore can be lifted by the machine each stroke, and five full-weight lifts will fill a car. The authors watched a 25 ton car filled in two and one-half minutes by seven bucketfuls, which is at the rate of 600 tons per hour. The men, exclusive of the trainmen, are required to work the machine, which consumes about 4 cwt. of coal per hour. A certain amount of blasting is necessary at the "shovel" mines to loosen the soil and ore, and thus facilitate the work of the machine. Holes 1¼ inches in diameter are made by driving in pointed steel bars to a depth of 20 feet These are opened out at the bottom by the explosion of small dynamite charges. Between 25 and 75 pounds of black powder are then poured in, tamped and exploded. A train of ten or twelve 25-ton cars is run alongside a steam shovel, and is worked forward by a locomotive as fast as the cars are filled. It is then drawn out, sorted, and made up into longer trains for transport to the docks.—[Jeremiah Head and A. P. Head in Cassier's Magazine for October.

It has been said in connection with the recent contract placed by Mr. W. C. Rhodes, of Cleveland, with the American Ship Building Co. for a Welland-canal-size steamer that the ship builders are asking $405,000 for the largest size modern steel freighters—505 feet over all. When it was reported, a short time ago, that $350,000 each was paid for the four Wolvin steamers of this class that are to be built at Lorain, the price was considered very high. The cost of the Rhodes steamer will very probably be fully $165,000. This steamer will be of the same dimensions as the Huron of the Rhodes fleet, but will have greater power. Her engines will have cylinders of 20 33 and 44 inches diameter and 40 inches stroke, and she will have two boilers, 12 feet 8 inches by 12 feet, supplying steam at 170 pounds pressure.—[Marine Review.

The removal of the Peerless Machine Works, of Kansas City, to Richmond, Ind., will take place this month.

HOW LONG WILL THE IRON REVIVAL LAST?

In the October issue of the *Engineering Magazine*, Archer Brown, New York resident partner of Rogers, Brown & Co., has an article on the "Revival in the Iron Trade; Will it Last?" Mr. Brown's editorial experience of some years ago is visible in the article, for both in subject treatment and in style it is highly creditable. At the outset he propounds the questions now generally asked in the trade concerning the new basis of prices and the extraordinary demand that caused it: "Will it Last? How can it last? Will not capital rush in, start the idle furnaces and mills, build new ones and quickly break down the markets by over-production? Will not new undertakings be checked by the high cost of structural steel, machinery, rolling stock, electrical equipment, and the like?" Starting with the first advance of 25 cents in Southern iron last December, Mr. Brown reviews the various stages in the marvellous rise in prices. Some statistics of world production and world consumption in recent years are given as bearing on the question of the permanence of present conditions. From the latter portion of the article which deals more immediately with considerations of interest to the iron trade we extract the following:

"Going back now to the question, 'Will it last?' Frankly, it must be admitted no man knows. It is not given to mortals to unlock the future. War, famine, pestilence, Bryanism, may intervene and upset all calculations. But the wise man faces the facts as they are before him, and builds his judgment on these, discarding optimism, pessimism, preconceived theories, and even tradition. There were never better settled or apparently sounder commercial traditions in the past than that dollar wheat, ten cent cotton, and ten-dollar pig iron (at Birmingham) marked the bottom limits in the great staples, but we became familiar with values scarcely more than half these, and men lived and prospered.

"The simplest and largest fact in the present situation is a demand greater than the supply. What makes the demand? What limits the supply? The demand is great because seventy millions of people have pinched and economized for six or eight years, and now are quite able to buy, and what is of more consequence, are in a mood to buy. They have made the old stove answer, worn out the harvester and threshing machine, postponed the building of the county bridge, got along with the old stationary engine or lathe, put off the purchase of needed rolling stock for the railroad, hesitated to try conclusions with England, in the building of ships, and generally have waited for the return of what is known as 'good times.' Now they want to replenish, from the sad-iron to the locomotive. Will they stop because prices advance? No, they will not. Here enters the element of human nature. Confidence breeds confidence Distrust feeds on itself. Two years ago the great railroads of the United States could have renewed much needed equipment at about half the cost that today they do not hesitate to pay. Did they do it? It is notorious that the richest hesitated most. An amusing illustration is the case of a master mechanic of a great road whose requisitions underwent the usual cutting in two in the middle when they reached the management. Among the track and shop supplies needed was a large belt for an engine. When it came it had suffered the usual pruning, and was just half long enough to reach. The writer will not soon forget an effort, in the summer of 1897, to find a buyer in New York for 100,000 tons of Alabama pig iron which a large interest was willing to close out at $6 a gross ton, duly stored in a warrant yard—a price unprecedented in the history of the world. Not one of the great banking houses of capitalists dare fare the perils connected with such a proposition, though money was ruling at three per cent, and nearly free storage on the material was guaranteed. Today almost any bank in New York would lend $15 a ton on it, and scarcely ask a question.

"Buying, therefore, will not stop because prices are up. The railroads must have enormous additions to equipment, or lose the great harvest of profitable traffic. The millions of farmers will buy their agricultural machinery, stoves, carriages and pianos, because crops have been good for three years, fetch good prices, the mortgages are paid off, and there is money in bank. Electrical equipment will not stop while street railways and lighting companies make large earnings, merely because dynamos and rails are dearer. Cities and towns will put in needed water and gas pipe without much regard to whether the cost is $18 or $28 a ton. It is perfectly true that some new enterprises, that otherwise would take shape, are deferred because cost is found to exceed engineer's estimates. But this builds a reserve demand that will come in to support the market in the future. In high steel buildings, in large cities, for example, there is a distinct limit to prices that may be paid for materials without bringing the cost to a point beyond earning ability. The merchant marine cannot be built up as rapidly from American shipyards on $28 steel as on $16 steel. But these are but eddies in the main current.

Difficulty of Increasing Production.

"The real factor in lowering prices will be in increased production, not diminished demand. How fast can the output of the furnaces be increased? I say not over 15 to 18 per cent per annum. There was incredulity in as high quarters as Mr. Swank, secretary of the American Iron and Steel Association, when this prediction was made early in the year. For were there not a couple of hundred idle blast furnaces in the country ready to blow in the moment profitable prices were reached? Would American capital or energy hesitate where the reward was so great?

"It may be profitable to analyze the factors which operate to restrict profitable production. In a situation like the present they are clearly revealed, and many fine theories are upset by common physical facts. Few people who have not actually run a blast furnace, realize what it means to fill the capacious maw of one of those monsters with raw material. A stack of 200 tons daily capacity, running on 50 per cent ore, must have delivered to it each day something more than 400 tons of ore, 250 to 300 tons of coke, according to the character of the metal required, and over 100 tons of limestone, besides sand, coal, and minor supplies—say 900 tons raw materials. Add the 200 tons of pig iron product shipped out, and we have a daily freight movement of 1,100 tons, taking no note of the disposition of the slag. This is 55 carloads of 20 tons each. The mining of the ore requires the labor of 150 to 300 men, according to location; the coal mining, coke making, quarrying of limestone, and transportation, at least 300 more. The furnace itself employs about 150 or more hands. It will be seen, therefore, that starting up a furnace of ordinary capacity calls immediately for the labor, from first to last, of nearly a thousand men; for the use of at least a thousand railway cars and many locomotives; for perhaps several steamers and vessels on the lakes; for capital, from the mines to the pig iron, of one to two millions of dollars, and last, but not least, for a high order of managing ability, the scarcest of all scarce commodities, in times like these. The easy theory, therefore, that production can be turned on, as from a faucet, when profits are high, does not fit the facts. It is needless to say that every nerve will be strained to get into operation at the earliest moment the few existing idle plants, but those who base their calculations on an increase of not over 12 to 15, per cent per annum in the next two or three years, will not go far astray.

Few New Iron Companies Organizing.

"It has not escaped notice that in all the present excitement little is heard of organizing companies to build new plants. Each of the great consolidations is planning additions to capacity, but there are few schemes to develop idle property, as was the case about 1890. There are reasons for this. The building of furnaces to sell town lots was generally disastrous. The impression is still abroad that there is a large reserve idle capacity. But the main factor in restraint is that, under present conditions, it would require at least a year and a half to build a good modern plant; the cost would be 50 per cent greater than a year ago—and who knows where iron would be when the furnace was ready to start? The wisdom of the policy of building and enlarging in the bad times, followed for many years by Krupp and Carnegie, is demonstrated in a period like this.

The Foreign Trade.

"What of the export trade? It is generally believed that this new factor is the all important one in sustaining American markets. Taking the iron and steel manufacturers as a whole, I believe this to be true. But so far as ores, pig iron, and

even steel billets are concerned, the movements has never reached 5 per cent of the product of the United States and probably will not for years to come. Radical changes in the freight and labor situations must occur before America can capture English and European markets with crude iron. She is shipping liberally, it is true, and will continue to ship, for prices in Europe will always be regulted pretty closely by those in the United States.

"But it is in the finished forms where American victories will be won, as they are now being won. In locomotives, wood, and iron-working machinery, agricultural machinery, nails, wire, bicycles and a hundred other lines, American inventive genius, great productive capacity, modernized plants, superior business organizations, etc., will maintain and doubtless increase the great total of $80,000 000.00 reached last year in her iron and steel exports. The effect of this great and growing foreign demand is sensibly felt in every department of the trade.

"The belief is widespread that exports from the United States must suffer a sharp check, if not come to a full stop, unless prices in America recede. This is a natural, but not well grounded, view. It assumes that the markets of the rest of the world go their way, irrespective of what the United States does. That was formerly the case, but it is so no longer. The world is now knit closely together in its industrial and commercial as well as its financial fabric. Influences that affect one nation are soon felt by the others. England and Germany were in the midst of industrial prosperity two years before it was felt in America, but now that she has responded, the added stimulus is felt over there. We think it phenomenal that the mills and furnaces throughout the United States should have their product booked half through next year, but in Germany and Belgium they are already booked all through the year 1900. The great Krupp works at Essen, employing thirty thousand men, are filled with orders until 1901. Germany has nearly overtaken Great Britain in pig iron product, but is nevertheless importing largely from both England and America to supply her deficiency. Great Britain shows a slackening in her shipbuilding industry, but her export trade in iron is again growing and all her lesser industries are exceedingly active. Prices of iron and steel have risen there almost as rapidly as in the United States. Middlesboro pig that sold last year for 43 shillings has reached 75 shillings and is now a little under 70.

"The fact is the great industrial awakening is world wide. China, India, South Africa, the Philippines, Japan, Russia, and the new island possessions nearer to the United States are full of projects for improvement. They have caught the renaissance spirit. The beginnings are small, but they suggest immense future possibilities. They want steam railways, electric lines, electric lighting, water works, locomotives, machinery, bridges, etc., and it scarcely seems probable that having felt some of the benefits of modern progress, they will decide to turn back. America has shown her ability to compete with the other industrial nations for this trade, and will continue to get it in increasing quantity.

What are Normal Prices?

"A word as to the new level of prices. It is too high of course to be permanently maintained. It is too high for the lasting good of this great industry. But we must not be misled by making false comparisons. The conditions reached in the lean years following the panic were abnormal, not natural. Iron was forced to $6 a ton at Birmingham on wages of 90 cents a day for twelve hours' work; on transportation rates that did not return the railroads' cost; and on destruction of royalties, or values of the ore and coal in the gorund. The same was practically true in the Lake Superior district. It was simply a struggle for life. Values of great properties shrunk from millions to hundreds of thousands. Labor and capital fled to other fields. America learned great and valuable lessons during this trying experience, among others, how to produce iron more cheaply than has ever been done in the history of the world. Perhaps in the end the experince may prove to have been a blessing. But we must not make the error of supposing that those were normal conditions, and that when we have escaped from them we are on an artificial basis. A sound view is that we are nearer normal conditions today than we were when 100,000 tons of $6 pig iron went begging for a buyer in New York. "A cent" a" pound for the best pig iron in the world should not, after all, paralyze the faculties of reasonable persons.

"It should not be forgotten that the cost of iron resolves itself substantially into three things: labor, transportation and royalties, or the value of the material in the ground. Labor, the largest item, is up 25 to 40 per cent in iron making. It is not yet too high for the good of the country. Transportation is up about as much, but who shall say the stockholders of the railroads and steamship lines are not entitled to a few dividends after years of waiting? It is now possible to credit ore and coal mines with something for the materials in the ground. But it is a violent assumption that the great iron and coal deposits of the United States, which are usually counted the foundation of wealth in an industrial nation, are actually worth something and should return a profit to their owners on material mined out? If these points are conceded, the legitimate cost of pig iron in the United States is at least 33 per cent above the low level to which it was forced in the years from 1895 to 1898. The manufacturer's profit, if any, must be added to this. It is some satisfaction to know also that cost is rising proportionately in other parts of the world. In Great Britain and Germany the increase varies from $2 to $4 per ton, according to kind of metal and locality where it is made. This is due mainly to the steady rise in the price of coke, although ores have advanced and are in short supply.

"Cautious investors as well as manufacturers quite naturally look forward to the time when collapse will again take the place of boom, and prices will drop below cost of production. Who shall stand against that day? The strong, who expect to survive, are taking extraordinary measures to equip themselves for whatever may happen. The huge consolidations—at least those newly organized—are free from bonded debts, with large provisions for working capital. Some of them indeed are lenders of money in the street. Nearly all have strengthened themselves by ownership of ore mines, coal mines, coke ovens and even transportation lines, so that they are independent 'from the ground up.' If the time ever again comes for a fight for existence, it will be between giants indeed, and no other nation can resist American inroads. But every observing man has noted, in the instructive years of the past decade, the wonderful tenacity of life of small plants well located and economically managed. Another thing that has not escaped notice is that in the 'survival' struggle, there is a marked tendency to equalize conditions in all the different districts. It is a fact capable of demonstration that the best returns on capital during the lean years were not from the great concerns in the most favored locations (barring one or two exceptions), but from certain smaller operations located in districts not usually spoken of as the cheap centers of production. It is a safe assumption, therefore, that, whatever lengths the consolidation movement may extend to, there will be plenty of strong undertakings on the outside that will keep the industry on the sound footing of free competition."

The Bettermann Boiler Flue Plug.—Reinhold Bettermann of Johnstown, Pa., who operates a boiler works and machine shop at Johnstown, has brought out within the past year the Bettermann standard boiler flue plug, which though in use for two years, had not been manufactured until brought out under the present auspices. Briefly, the device consists of two flanged plugs, each with an asbestos gasket packing, saturated in linseed oil to prevent action of the water on them, and a ⅝-inch connecting rod. The plug on the fire end of the boiler is drilled and tapped to receive a ⅝-inch iron rod; it also has a square extension upon which a wrench is used in tightening, and to prevent the plug from turning and injuring the packing in the operation of adjustment. The plug on the smoke-box end of the boiler is also drilled but not tapped; and upon the outer end is provided a raised boss with a finished surface, against which in the application of the plug a finished nut comes in contact, securing a tight joint for the rod, as well as the plugs, at either end of the flue. The ease of application, readiness of adjustment and economy in time required for repair, are among the advantages of the device. A leaking flue sometimes necessitates a shut down for lack of means at hand for quick repair. The adjustment may be made without damage or strain to the flue sheet, without tearing away walls for adjustment, and its removal is accomplished without trouble and without damage to the flue sheet.

21-INCH UPRIGHT DRILL.

The Cincinnati Machine Tool Co., which makes a specialty of the Cincinnati upright drills, is the manufacturer of the tool shown in the accompanying cuts, a 21-inch wheel and lever drill. It is designed for work requiring special strength, and performs a considerable range of service from work of the smallest size up to that calling for its utmost capacity. In the detailed description below its general features are covered, and details given of back gears, power feed and automatic stop.

The table is vertically adjusted on the column by means of a worm and worm gear, in connection with a rack and pinion, thus keeping the table in the desired position, and without locking the table by always clamping screws, prevents the table from dropping. This also enables the operator to adjust the table to any height. The table can be swung entirely around the column, leaving the base-plate free for larger work. The worm operating the spindle of the drill is placed below the worm wheel, and runs in a large worm box, which allows the worm to run in oil continually. The worm boxes on all Cincinnati drills are arranged to drop, to disengage the worm and worm wheel. This movement is brought about by a new device operated by levers in the front of the head, and is adjusted so that the worm and the worm wheel are engaged to the proper depth at all times, preventing any breaking of teeth in the worm wheel.

All racks and gears are cut from the solid. The head is split, so as to take up the wear of the sleeve. The ratchet pin of the hand lever, as well as the ratchet wheel teeth, are milled slightly taper, to allow the ratchet pin to engage at the proper depth at once, and will always by this arrangement be a close fit. The quick return lever is conveniently placed on the left of the drill, and returns the spindle very freely. Jam nuts are used on the spindle, so that the drill may be safely used for undercutting and facing. Special clamping screws are used in the table arm, so as to give greater service than the cap screws generally used.

The back gear machines are powerfully geared, the ratio of the bevel gears being 2 to 1, making the ratio of the spindle 10 to 1, and thus making the machine capable of doing very heavy work. The power feed machines are fitted with a graduated automatic stop for determining the depth of holes The worm shaft is bored its entire length, to allow the friction shaft to pass through, and to permit the nut to be placed conveniently in the front of the head. The feed cones have three steps, allowing a 1-inch feed belt. The feeds are arranged to operate equally well on steel or cast iron, and for drilling 1-inch deep are 250, 150, and 90 revolutions of spindles. The drill can be furnished with friction clutch pulleys for tapping if desired.

This drill is manufactured also in 24, 28, 32, 36, and 40-inch sizes. The accompanying illustrations show the 21-inch drills in three styles. Fig. 1 is the drill without back gear or automatic stop; Fig. 2 is the drill equipped with back gears; Fig. 3 shows back gears, power feed and automatic stop.

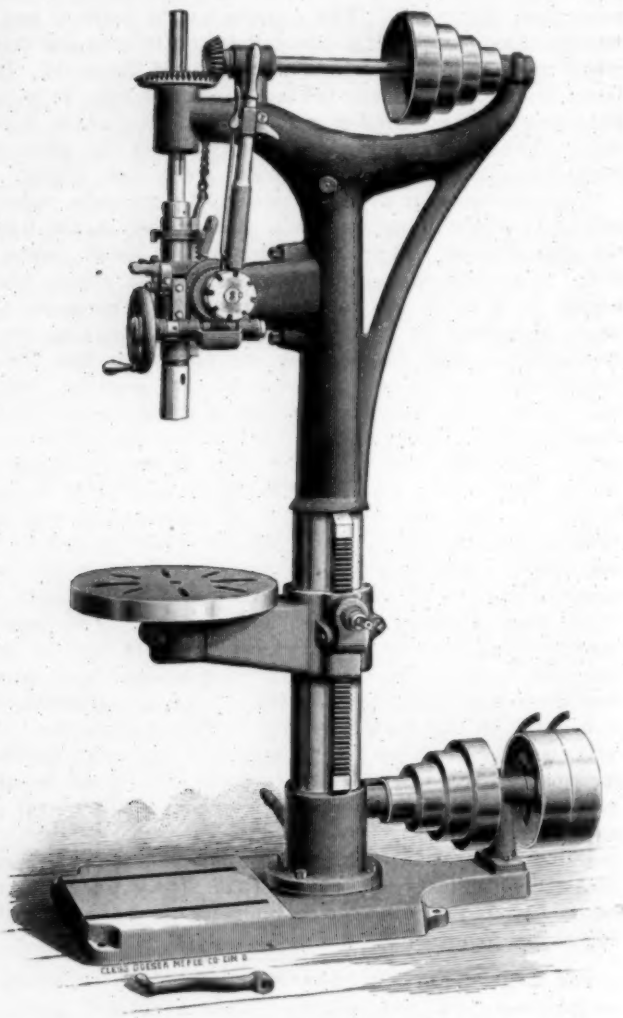

FIG. 1.—21-INCH WHEEL AND LEVER FEED DRILL.

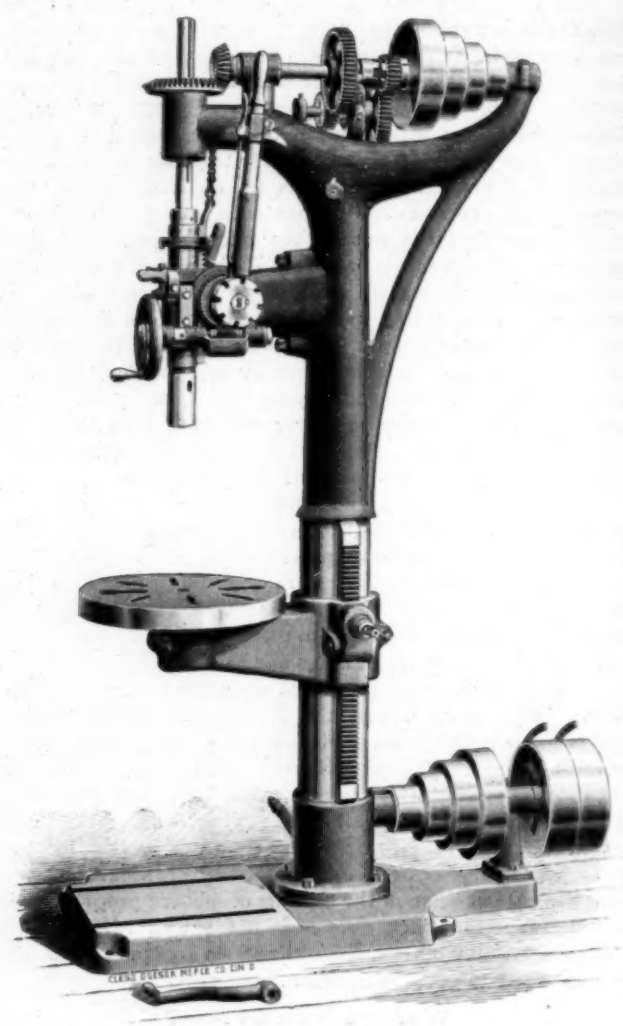

FIG. 2.—21-INCH DRILL WITH BACK GEARS.

Alabama Coal & Iron Co.

The prospectus of the above company has been issued at New York. The company is incorporated under the laws of New Jersey with a capital stock of $5,000,000, divided in $2,500,000 7 per cent preferred stock and $2,500,000 common stock.

The prospectus says that the following properties will be taken into the new company: Clifton Iron Co.'s property at Ironton; the Gadsden Furnace & Ore Co.'s property at Gadsden, Ala.; Mary Pratt Furnace at Birmingham; Gate City Co., at Birmingham, and the Standard Coal property in Tuscaloosa county. The officers are T. G. Bush, president, Anniston, Ala; John E. Searles, vice-president and treasurer, New York; F. M. Jackson, general manager, Birmingham, Ala. The directors are Abram S. Hewitt, John E. Searles Samuel Thomas, New York; J. W. Middendorf, R. H. Edmonds, Joshua Levering, Baltimore; John Skelton Williams, Richmond, Va.; T. G. Bush, Anniston, Ala.; F. M. Jackson, Birmingham, Ala.

INDUSTRIAL SUMMARY.

[I you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The Riehl Mfg. Co. has been incorporated at Trenton, N. J., with an authorized capital of $100,000. The company succeeds to the iron and steel business of the John B. Riehl Co., Ltd., of Philadelphia. The incorporators are John B. Riehl, Charles Schneider, W. P. Boltz and George Davis, Philadelphia, and Charles F. Ackley, Camden.

The Olive Foundry & Machine Co., Ironton, O., capital stock $30,000, has been incorporated by Thomas M. Adams, and W. B. Seaton, of Ashland; W. C. McKee, of Hanging Rock, and J. L. Anderson and F. C. Tomlinson, of Ironton. They will operate the plant recently purchased from the Second National Bank of Ironton. The plant started up this week. F. C. Tomlinson is president and Thos. M. Adams, secretary and treasurer.

New Construction:—

The Struthers Iron & Steel Co., whose sheet mill plant at Struthers, O., was burned some months ago, has let a contract for five buildings, which will be 60x150, 64x64, 50x100, 38x150 and 38x48 feet. Temporary structures now enclose the mills, which are again in operation.

FIG. 3.—21-INCH DRILL, WITH BACK GEARS, POWER FEED AND AUTOMATIC STOP.

The National Foundry & Machine Co., Louisville, Ky., whose plant was recently burned, has purchased additional ground, and will rebuild on a larger scale.

Work has begun on the foundations for the new plant of the Coshocton, (O.) Rolling Mill Co., recently organized by Ambrose Beard, Coshocton; W. C. Bryant, Cambridge, and D. A. Raiff, of Coshocton.

The Sheffield Land & Improvement Co., of Lorain, O., is negotiating with the McMyler Mfg. Co., of Cleveland. The McMyler plant is in need of more ground room and this cannot be secured in its present location.

The Cleveland Machine Screw Co., Cleveland, is building an addition to its plant for the purpose of manufacturing automobiles. It will be three stories high, 50x200 feet, and will cost $30,000.

The burned portion of the American Tin Plate Co.'s plant at Atlanta, Ind., will be rebuilt at once.

It is expected that the new sheet mill building at East Liverpool, O., will be closed in in about a month The installation of machinery will await the completion of an extension of the Panhandle railroad.

The Cincinnati Planer Co., of Cincinnati, will erect a new engine and boiler plant, adjoining its present quarters. The business of the company has increased rapidly.

The Jeffrey Mfg. Co., of Columbus, O., will build a machine shop 267x150 feet, to cost $15,000.

The Garvin Machine Co., of New York, and the Niles Tool Works, of Hamilton, O., are erecting large plants in Berlin. The Buffalo Forge Co., are expected to build a Berlin works also.

The Diamond State Steel Co., of Wilmington, Del., is preparing land recently bought in South Wilmington for buildings which will soon be erected. The main building mill will be of steel, 8.47 feet long and of unbroken construction.

The Champion Iron & Steel Co., has plans perfected for its new plant at Muskegon, Mich., and the contracts will be opened in a few days. The foundations, brick, and corrugated iron work will be done by the company, but a contract will be let for the frame work. The main building will be 350x50; the lean-to 200x35; tin house, 150x60; boiler-room, 45x75; the puddle mill, 100x60. Two 2,500 h. p. engines will drive the machinery, and a 15-ton electric crane will travel the length of the main building. The buildings will be completed in six months.

The Harrington Machine Co., of Philadelphia, has prepared drawings for a brick and iron boiler house. Estimated cost $2,500.

The Virginia Iron, Coal & Coke Co., Knoxville, Tenn., has let contracts for the building of over a thousand new coke ovens. Three hundred at Toura Creek coal mines in Wise Co., Va., 500 at Coeburn, Va., and 300 at Looney's Creek mines, near Big Stone Gap.

The Harrow Spring Co. will build a rolling mill in connection with its works at Kalamazoo, Mich., and will discontinue the operation of its Eastern mill.

The Pittsburg & Lake Erie Railroad have purchased 15 acres of land at McKees Rocks, Pa., at the rate of $5,000 per acre, and will erect immense new shops, which will be the largest of their class in the country.

The plant of the Gray Iron Works at Logansport, Ind., will soon be increased. An addition of 120 lots and a five-acre tract has been laid out.

The Reading Railway Co. will build extensive shops at Reading, Pa. The new plant will be one of the most extensive in the country, equipped with the latest appliances.

The Logan Iron & Steel Co., whose plant is at Burnham, Pa., will greatly increase its equipment. The work will be finished by Jan. 1.

Fires and Accidents:—

An explosion occurred in the engine room of the merchant mill of the Federal Steel Co., at Joliet, Ill., on Sept. 24. The accident was due to the slipping of the belt.

The Eagle Foundry, of Columbus, O., was damaged by fire, Sept. 20. Loss over $1,000, and orders will be delayed for two weeks.

The foundry of Berman & Co., manufacturers of agricultural implements, Louisville, Ky., was partially destroyed by fire Sept. 21. The buildings were damaged and considerable machinery destroyed. Loss $20,000, covered by insurance.

The insurance carried by the Lee Gin & Machine Co., Memphis, Tenn., upon its property which was recently destroyed by fire, is about $43,000.

Power Equipment and Machine Tools:—

James Bonar & Co., Carnegie Building, Pittsburg, Pa., mention among recent sales the following Sweets steam separators: Pittsburg Steel Hoop Co., Glassport, Pa., one 10-inch, two 7-inch and two 6-inch; First National Bank, Pittsburg, Pa., one 6-inch; Wheeling Steel & Iron Co., Wheeling, W. Va., one 6-inch, one 8-inch; Homer Laughlin China Co., East Liver-

pool, O., three 4-inch, one 13½-inch, one 3-inch, and one 4½-inch; Youghiogheny Light, Heat & Power Co., Connellsville, Pa., two 6-inch, and one 5-inch; Shoenberger Steel Works, Pittsburg, Pa., one 16-inch; Scotdale Iron & Steel Co., Scotdale, Pa., two 8-inch and one 4-inch; Penn Iron & Coal Co., Canal Dover, O., one 15-inch; Carnegie Natural Gas Co., Pittsburg, Pa., two 10-inch. Of their Pittsburg water heaters and purifiers the following sales were made lately: Pittsburg Steel Hoop Co., one 1,250 h. p.; Standard Ice Co., Allegheny, Pa., one 600 h. p.; Erie Transit Co., Erie, Pa., one 500 h. p.; Youghiogheny Light, Heat & Power Co., Connellsville, Pa., one 500 h. p.; Wm. J. Wooley, Cincinnati, O., one 75 h. p.; John O'Brien, Cincinnati, O., one 150 h. p.; Penn Iron & Coal Co., Canal Dover, O., one 1,500 h.p.; Arbuckle-Ryan Co., Toledo, O., one 400 h. p.; York Mfg. Co., York, Pa., one 30 h. p. Business in the company's other specialties, Ashton Pop Saftey Valves, Bonar gauge cocks, Bonar oil filters and Bundy steam traps is greatly in excess of any previous records. This company has been in business four years on Oct. 15, and has shown marked progress.

The Sharon Steel Co., of Sharon, Pa., has placed orders with William Tod & Co., of Youngstown, O., for two blowing engines for the new open-hearth steel plant at Sharon.

The Garvin Machine Tool Co., of New York, continues to ship quantities of machine tools, which will be utilized in the shops of the German Garvin Machine Co., now nearing completion in the vicinity of Berlin.

The Bausch & Harris Machine Tool Co., of Springfield, Mass., made a shipment of radial drills last week to E. Sonnenthal, Jr., of Berlin.

Manning, Maxwell & Moore have shipped to Germany a mammoth boring mill. It is capable of boring cylinders 20 feet in diameter. The machine weighs over 160,000 pounds and cost $15,600.

Foreign demand for pumps is so large that many of the larger plants report it necessary to run day and night. The call is so great that some companies are buying castings from other foundries, so as the better to meet foreign requirements. Recent exports included 32 standard centrifugal pumps for the Mexico Mine & Smelting Company, of the City of Mexico; 11 manganese steel centrifugal pumps to Copenhagen, Denmark, and other large lots to Stockholm, Sweden, Bombay, India and the Klondike.

The Brown Hoisting & Conveying Machine Co., of Cleveland, has secured the contract for the supply of three big traveling cranes, which will be used in the plant of the Dominion Iron & Steel Co., of Sydney, Cape Breton, Nova Scotia.

The Pittsburg District:—

Edward E. Erikson, consulting and contracting engineer, Conestoga Building, has received a contract from the Coshocton Rolling Mill Co., now building a sheet mill at Coshocton, O., for two annealing furnaces, and two blocks of sheet and pair furnaces. Another contract rceently taken by Mr. Erikson is from the Mesta Machine Co. for two 15 and two 20-ton air furnaces for the new works of that concern at Homestead, Pa.

Walter Kennedy, consulting engineer, Pittsburg, has a contract for building four Kennedy skips, at the new furnaces building by the Dominion Iron & Steel Co., at Cape Breton, N. S. The contract for furnace erection is in the hands of the Riter-Conley Mfg. Co., of Pittsburg.

The Lewis Foundry & Machine Co., of Pittsburg, is engaged on three European orders, one for the Phoenix Union at Harum, Westphalia, Germany, where the rod mill is being shipped; another for Austria, and a third for Germany, while a maller order is being filled for Mexico. The order for Germany consists of a No. 5 Garrett continuous rod mill of 550 tons capacity. It will require 25 cars for rail transportation. The Austrian order is for a universal mill.

Pittsburg dealers in pipe have been notified that the Central Foundry Co., the soil pipe consolidation, whose headquarters are in New York, has advanced the price of soil pipe from 10 to 15 per cent. One year ago four-inch pipe was selling at $7.20 per 100 feet; the advance makes the present price $18. A Pittsburg company has been formed to start an independent plant, as previously noted.

The Secretary of State of Pennsylvania has ordered a survey to be made of certain land made by the Carbon Steel Co., Pittsburg, by filling in the Allegheny river bank between 32d and 33d sts, and a patent will be issued later to the company for the land so made which amounts to nearly two and a half acres, valued at $130,000.

On Thursday, Sept. 28, the directors of the newly formed Pittsburg Stove & Range Co., formed by consolidating nine stove foundries in the Pittsburg district, met and elected the following officers: President, Charles A. Bradley, of A. Bradley & Co.; vice-president, Wm. T. Bradberry, of the Anschurtz-Bradberry Co.; secretary, John S. Rowe, of DeHaven & Co., and treasurer, John S. Graham, of Baldwin & Graham. The retail stores conducted by a number of the foundries will be discontinued, and the company will do a wholesale business exclusively. The building at the corner of Liberty ave. and Wood st., Pittsburg, has been secured, and the first floor will be used as a sample room, the general offices being on the second floor. Five of the nine foundries will be discontinued, the whole business being concentrated at the remaining four, which are those of Graff & Co., the newest, at Monongahela City; Baldwin & Graham, New Castle, and DeHaven & Co., and the Anschutz-Bradberry Co., on Preble ave., Allegheny. It is stated that the company will not advance prices, but will effect economies in manufacture and distribution, and will add the manufacture of steel ranges for both coal and gas.

A meeting of the stockholders of the Hunt Air Brake Co., New Kensington, Pa., will be held on Oct. 9 to act on a proposed increase in the capital stock, to provide funds for an enlargemet of the works, which manufacture air brakes for electric cars.

A West Virginia charter has been issued for the Orient Steel Works, of Allegheny, Pa., to operate the old Jennings plant on Preble ave., containing a 10-ton acid open-hearth furnace, two trains of rolls and a hammer. The corporation is capitalized at $10,000, with $1,000 paid in, and the privilege is given of increasing to $150,000. The incorporators are Grant McCargo, of the Tri-State Gas Co., H. G. Wasson, of Jennings & Wasson, attorneys, H. H. Patterson, L. D. Davis, and James P. Brownlee.

Erection is nearly completed at Homestead of the plate mill purchased some time ago by the Carnegie Steel Co. from the Bethlehem Iron Co., and it is expected the mill will be put in operation within a month.

The Shiffler Bridge Co., Pittsburg, last week started in full operation its new plant at West Homestead, which are known as the Walker works. Plans are now being prepared for an addition, east of the present plant, which will double the size, and ground will probably be broken in a short time.

It is stated that the H. C. Frick Coke Co. is about to close a deal for the purchase of a tract of 13,000 acres of coal land, south of Uniontown and extending to the Monongahela river, just outside of the regular Connellsville field. Options on the property have been held for some time.

The Pittsburg Brass Co., Pittsburg, will shortly apply for a charter to manufacture brass specialties. The applicants will be Thomas Wald, Henry Thurman, H. W. Ward, Joseph S. Brown, and H. R. Beatty.

A strike was begun Monday morning in nearly all the foundries in Pittsburg and vicinity. The matter at issue is a rather complicated one. The molders have asked for the establishment of a minimum rate of $3 a day, with an advance of 10 per cent to all men who have been paid that much or more. The coremakers demand a minimum of $2.75 a day and anadvance of 10 per cent for all who have been receiving that much or more. Ten firms have agreed to the demand of the core-makers, and the core-makers of these firms are at work. There is an agreement between the National Foundrymen's Association and the Iron Molders' Union, both bodies being national in scope, that all differences shall be settled by arbitration. Less than half the Pittsburg molders belong to the national body, and those who do claim that the present movement is not in violation of the national agreement because the differences are confined to Pittsburg and vicintiy A new organization has been formed, known as the Amalgamated Molders' Association of Pittsburg, which is conducting the strike independently.

Chicago District and Northwest:—

The Stover Novelty Works, a co-partnership between D. C. Stover, and F. W. Hoefer, manager, began business in March,

Are You Interested in Feed-Water Heaters?

We make so many heaters that we can hardly tell you about them all, especially the smaller ones. Right now we are engaged in building a single heater of 10 000 H. P., two of 6,000 H. P., two of 5,000 H. P., a whole batch of 4,000 H. P. Heaters, 3,000 H. P., 2,500 H. P., and so on down.

You will be interested in that 10,000 H. P. fellow—largest heater ever built—will show you illustrations of it as soon as it is finished. Meanwhile if you are in the market for something very good in the way of a feed-water heater and purifier, we hope that you will not overlook investigating our "Cochranes."

HARRISON SAFETY BOILER WORKS,

Clearfield & 17th Streets, PHILADELPHIA, PA.

1892, for the manufacture of novelties, but soon drifted into the manufacture of machinery. On Oct. 31, 1896, Mr. Stover sold his interest to A. G. and F. W. Hoefer. On Jan. 1, 1899, E. A. Hoefer acquired an interest in the company. The business now being owned by the persons after whose name the new company is incorporated, it has been decided to change the name from Stover Novelty Works to Hoefer Manufacturing Co. The incorporators are F. W. Hoefer, A. G. Hoefer and E. A. Hoefer. The business continues under the former management.

The Pressed Steel Co., Pittsburg, will add 20 acres to its Joliet, Ill., site, and a new plant will be in operation by Dec. 1. Arrangements have been made with the Illinois Steel Co. to supply 400 tons of plate a day to the Joliet works. By Jan. 1 the company will have a capacity of 130 cars a day in the three plants, using daily 1,600 tons of steel plate.

The Joliet plant of the Federal Steel Co. broke its record for the output last week. The new record is: Merchant mill, for week, 708 tons; rod mill, 4,050 tons; billet mill, 2,099 tons.

The Robert Aitchison Perforated Metal Co., Chicago, has recently entered orders as follows: One for special perforated brass for use in the United States Navy Yard, at Mare Island, Cal; one for sizing screens for a large iron mine in New York; also a large order of perforated steel recently completed, for use in one of the beet sugar works being erected in Michigan. Business with the company is active and it has almost doubled its factory force in the past three months.

The Illinois Malleable Iron Co. is about to begin construction of a foundry, boiler-room and engine-room at Diversey ave and the railway tracks of the Northwestern company. The buildings are to cover 100x311 feet, and are to cost $25,000.

The large foundry and machine shop of McQuin & Cludister at Braidwood Ill., was burned Sept. 27. A large amount of machinery, worth $10,000, was destroyed.

The Dillon-Griswold Wire Co., Sterling, Ill., is pushing its wire rod mill to completion. The company recently tested the furnace for heating steel billets, and found it to work satisfactorily.

General Industrial Notes:—

The stockholders of the Colorado Fuel & Iron Co., Denver, have increased the capital of the company to $25,000,000, of which $2,000,000 is preferred stock, drawing an annual dividend of 8 per cent. The directors were authorized to issue from time to time, the additional $12,000,000 stock provided for in payment for property or improvements.

Geo. M. Clark, of Cincinnati, who recently purchased the Ohio Falls Iron Co 's plant, at New Albany, Ind., announces that it has been overhauled and will be in operation this week. Merchant bar is the exclusive product.

A successful test has just been made of a steel plate, made, forged and tempered at the Carpenter Steel Works, Reading, Pa. It was 36 inches square and 5½ inches thick. A six-inch shot fired against it cracked the plate, but there was no indentation. Another plate 59 inches square, and three inches thick, has been prepared.

The Vulcanus Forging Co., of Cleveland, has increased its capital stock from $20,000 to $50,000.

The Commonwealth Trust Co , of Harrisburg, receiver for the Harrisburg Car Mfg. Co., has been instructed to sell the property provided $150,000 can be obtained. The claims of unsecured creditors aggregate about $175,000, and of secured creditors about $125,000.

Ironton, O , parties are negotiating with the Ironton Coal & Iron Co., for the lease of the Vesuvius furnace property.

The Cambria Steel Co., Johnstown, Pa., has purchased the farm of Frank Fry, on the Clover Creek branch of the

PIG IRON and COKE.

We represent thirty-five leading brands of pig iron, comprising every quality made in the United States and even during famine times can keep our friends supplied.

It is a decided advantage for consumers to have orders placed with us on account of our sources of supply being immensely greater than those of any other pig iron house.

The best brands of Connellsville, Pocahontas and West Virginia foundry coke are handled by us.

We are issuing a leaflet giving synopsis of prices, production and stocks of pig iron and shall be pleased to forward on application to any one interested.

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Our No. 1 Shop Saw.

Shop Saws

equipped with automatic or gravity feed for cutting tool steel and all softer metals.

MADE IN FOUR STYLES.

If you need a cheap saw of small capacity write us.

THE Q AND C

Chicago.

New York.

Altoona division of the Pennsylvania railroad, for $8,500. The land contains valuable deposits of limestone, which are to be opened at once.

The Union Steel & Chain Co., of New York, has leased the furnace at Big Stone Gap, Va., and will place it in condition to be operated. E. J. Bird, Sr., of Iron'on, O., who operated this furnace before will have charge.

The Falcon Iron & Nail Co., Niles, O., has shipped 80 tons of galvanized sheets to the Phil ppines, and the Columbia Mfg. Co. has contracted to furnish two car loads of corrugated sheet iron.

The Chateaugay Ore & Iron Co. has added six new fires at its forge at Standish, Clinton county, N. Y., the second addition within a year. At the Chateaugay mines at Lyon Mountain the output is 800 tons of ore a day.

An effort will be made to start up the Ætna Machine Shop and Foundry at Bellaire, O. Several business men are behind the movement.

The options of the Lake Superior Steel Co. on the plants of the West Superior Iron & Steel Works, the Duluth Mfg. Co., and the Ironton Structural Steel Co., have been closed at Duluth. The new company, of which John E. Searle is the putative head, is to have $5,000,000 capitalization.

The improved 8-inch guide mill of the Brown-Bonnell plant at Youngstown, O., will increase the output to 37,000 pounds a turn. A new furnace has been added and a new varcupine boiler installed.

It is reported that furnaces at Sheridan, Pa., and the half interest in the Cornwall iron ore banks of Gen. Edward Burd Grubb, of Burlington, N. J., have been purchased by the Pennsylvania Furnace Co. The price paid was $3,000,000.

The Wheeling Iron & Steel Co., is making extensive improvments at its Benwood, Top Mill and Belmont plants, Wheeling district. At Belmont the old brick casting house is being replaced by a steel building 150 feet long and 50 feet wide. Other improvements include a new heating furnace at skelp mill No. 2, and two batteries of Stirling boilers at the Benwood mill.

The blast furnaces at the Tidewater Steel Works, Chester, Pa., were started Sept. 21. The plant had been shut down for eight years.

The Harrisburg Foundry & Machine Works, Harrisburg, Pa., is adding new men to its force. The company is using part of its new plant for the erection of some of its engines. Several were shipped last month to Eastern cities for installation in electric light plants.

American Steel & Wire Co. officials now announce the purchase of the Witherbee, Sterman & Co. property, at Port Henry, N. Y., and the property of the Crown Point Iron Co., at Crown Point, N. Y. The Witherbee, Sherman & Co. property consists of iron mines at Mineville, the Cedar Point furnace, 71x16 feet, at Port Henry, and the Lake Champlain & Moriah railway, 16.49 miles in length, connecting the furnace and mines. The Crown Point Iron Co.'s plant at Crown Point, N. Y., seven miles farther south, on the west shore of Lake Champlain, consists of 27 miles of railroad, two stacks, 60x17 feet and 70x18 feet, 20,000 acres of land and some tenement property. The Crown Point company's railroad is not operated. By acquiring these properties the American Steel & Wire Co. is assured a pig iron supply for its Worcester mills.

Directors of the American Tin Plate Co. on Sept. 29 declared a quarterly dividend of 1¾ per cent on the preferred stock of the company, payable Oct. 30, to stockholders of record at the close business Oct. 20, 1899. Transfer books will be closed from the 21st to 30th day of October, 1899 both inclusive.

At Pottstown, Pa., at a recent meeting of the board of directors of the Warwick Iron & Steel Co., the exceutive committee, Edgar S. Cook, chairman, and the finance committee,

MATTHEW ADDY & CO.,

Cincinnati, O.

St. Louis. Philadelphia. New York. Chicago. Pittsburg.

PIG IRON.

Sole Sales Agents for the

TENNESSEE COAL, IRON & R. R. CO.,

The Largest Makers in the World of High Grade Foundry, Mill and Open Hearth Basic Irons for the General Market.

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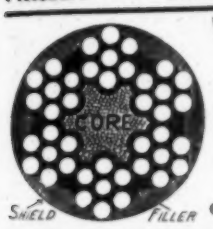

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Rolling Mill, Rod Mill, Wire Mill and Blast Furnace CASTINGS of Every Description.

CHILLED AND HARD GUIDES A SPECIALTY.

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MALLEABLE

HIGH GRADE CASTINGS. QUICK DELIVERIES.

BUHL MALLEABLE CO., Detroit, Mich.

W. H. Shelmerdine, chairman, were authorized to proceed at once with the erection of an additional blast furnace adjoining the present one.

A Keystone, W. Va., dispatch says that the Pulaski and Lick Branch companies have fired 200 new coke ovens. Nearly all the companies in that field are increasing their coke facilities.

Merchant & Co., Inc., Philadelphia, New York and Chicago, have rapidly and successfully developed their Babbitt metal business. For 25 years Merchant & Co. have been large manufacturers of Babbitt metals of all classes, although they have been better known to the trade as a tin plate brass and copper house. They are now giving more attention to the Babbitt metal department and state that they are producing the largest line of this metal in the country. Their extensive business they attribute largely to advertising in first-class publications, bringing their products to the attention of the best buyers.

The Andrews Wire & Iron Works, of Rockford, Ill., manufacturing wire goods and hardware specialties, are operating to their utmost capacity. Starting on Monday morning at 7 o'clock, the engine is kept running until the following Saturday night. All floor space is in use and it has been necessary to put up temporary machines and do some of the work outside. They have figured their utmost capacity up to Dec. 1 and orders as received are checked off from this amount. When this is exhausted salesmen will be withdrawn on boliday goods. An order is just being completed for the American Steel & Wire Co. of 100,000 tea and coffee pot stands, to be distributed among the State fairs for advertising purposes. These were to be made at the rate of 10,000 a week but the company requested 3,000 a day, and the employes undertook with a will the extra work. Free lunches have been served by the company to all its employes and in other ways incentives to the rapid execution of orders have been furnished. Excellent feeling exists between the company and its employes. A recent visitor, noting the rapidity with which work was turned out was surprised on being told in answer to his

U. BAIRD MACHINERY CO.,

423-425 Water St., **PITTSBURG, PA.,** 124-126 First Ave.

Machine Tools and Supplies. Send for list of Second-hand Tools.

THE BEST AND THE CHEAPEST.

BRIER HILL PORTLAND CEMENT.

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YOUNGSTOWN, O.

KENTUCKY FIRE BRICK WORKS.

CUPOLA BRICK. STEEL WORKS BRICK.

KENTUCKY FIRE BRICK WORKS, PORTSMOUTH, O. HIGH GRADE FIRE BRICK BEST BLAST FURNACE & ROLLING MILL BRICK

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Ore and Coal Handling Machinery

For Blast Furnaces, Docks and Mines.

MINING MACHINERY,
HIGH GRADE HOISTING ENGINES.

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Regenerative Gas Furnaces and Water Seal Gas Producers.

Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.

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SUITABLE FOR
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CATALOGUE SENT ON REQUEST.

PHOENIX HORSE SHOE CO., POUGHKEEPSIE, N. Y.—JOLIET, ILL.

inquiry, that the shop was running on day work and not on piece work.

The large West End Furnace and rolling mills at Roanoke, Va., have been purchased by C. R. Baird & Co., of Philadelphia, and will be put in operation immediately. These works were built in 1891 at a cost of over $750,000, and are modern and complete. The property embraces more than 50 acres in the city of Roanoke, with a number of buildings, dwelling houses, etc. The furnace is 18x82 feet, and has a capacity of 200 tons per day. The rolling mill plant contains 15 double puddling furnaces, and it is the intention of the new owners to utilize part of the pig iron product for bar iron, etc. Baird & Co. have also acquired more than 1,000 acres of ore property, capable of producing 1,000 tons of ore a day. All of the mines are within four miles of the furnace and insure an abundance of high grade ore at low cost. A large stock of ore, coke and limestone is being accumulated and the first cast of iron will be made early in October.

GOVERNMENT bids were opened Sept. 22 to furnish 2,288 tons of steel rails, 56 pounds per yard; 433 tons of angle splice bars, fish plates, rails 24 feet long; 13½ long tons of bolts and nuts, bolts to be 3½x¾, with hexagonal nuts; 69 tons of spikes 5¼x$\frac{9}{16}$. The bidders were: Cambria Steel Co., steel rails, $35 per ton; angle splice bars, 2¾ cents per pound; bolts and nuts, 3¾ cents per pound. The Carnegie Steel Co., Ltd., rails, $30 per ton; bars, $44.80 per ton; bolts and nuts, $89 60 per ton; spikes, $72 80 per ton. Benjamin J. Watson, bolts and nuts, $80.50 per ton; spikes, $61 50 per ton. The Pennsylvania Steel Co., rails, $34.60 per ton; bars, $57.59 per ton; nuts, $99.80 per ton; spikes, $60.03 per ton. The Richmond Standard Steel Spike & Iron Co., spikes, $67.87 per ton. Dillworth, Porter & Co., Ltd., spikes, $58.24 per ton. Lake Erie Iron Co , bolts and nuts, $3.80 per 100 pounds.

Foundries

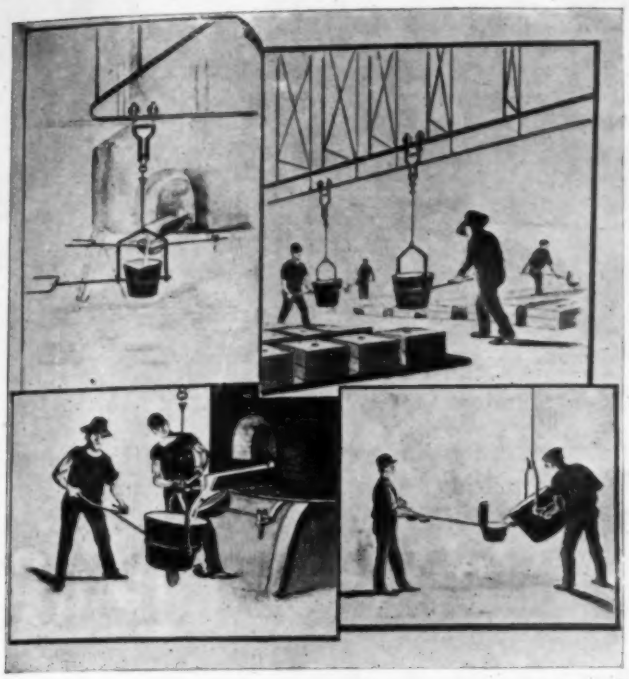

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Exhibit showing furnaces where the **UEHLING METHOD** has been adopted.

Location.	Stacks.	Daily Capacity. Tons.	Style Machine.
National Tube Works Company, McKeesport, Pa.	2	600	Double.
Carnegie Steel Company, Ltd., Duquesne, Pa.	4	2,400	Double.
Carnegie Steel Company, Ltd., Edgar Thompson	9	3,500	Six.
Carnegie Steel Company, Ltd., Rankin (Carrie)	2	700	Double.
Carnegie Steel Company Ltd., Pittsburg (Lucy)	2	800	Double.
Struthers Furnace Company, Struthers, O.	1	301	Sing'e.
Laughlin & Co., Ltd., Pittsburg, Pa. (Eliza)	5	2,000	Double (2)
Oliver & Snyder Steel Company, Pittsburg, Pa. (Edith)	1	400	Double
Oliver & Snyder Steel Company, New Castle, Pa. (Rosena)	1	500	Double.
Shenango Valley Steel Company, New Castle, Pa.	2	700	Double.
Bellaire Steel Company Bellaire, O.	2	700	Double.
Lebanon Furnaces, Lebanon, O.	2	500	Double.
Tennessee Coal, Iron & Railroad Company, Ensley, Ala	4	800	Double.
Riverside Iron Works, Wheeling, W. Va	2	700	Double.
American Steel & Wire Co	*	3,000	Double (3)
Totals	46	17,700	.....

For particulars write

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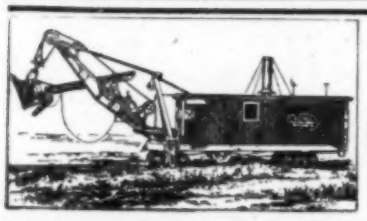
BY THE

Uehling Method

is covered by U. S. patents Nos. 548,146, 629,480 and 632,031, which are fundamental, and others are pending.

The use of the Uehling Method at the furnaces mentioned has shown reduced labor cost, while **SANDLESS IRON** has proved a great advantage to the consumer.



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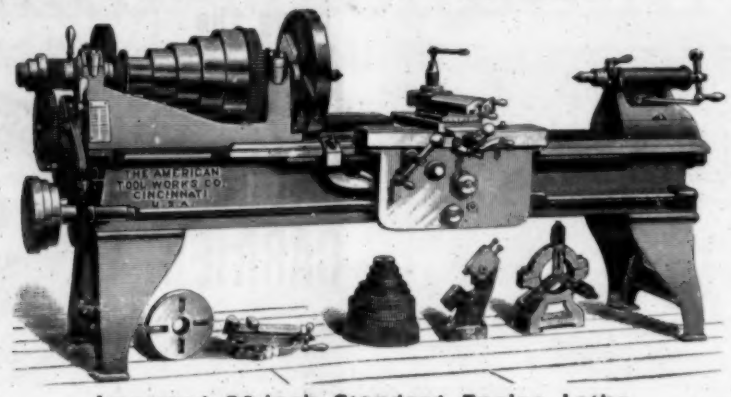

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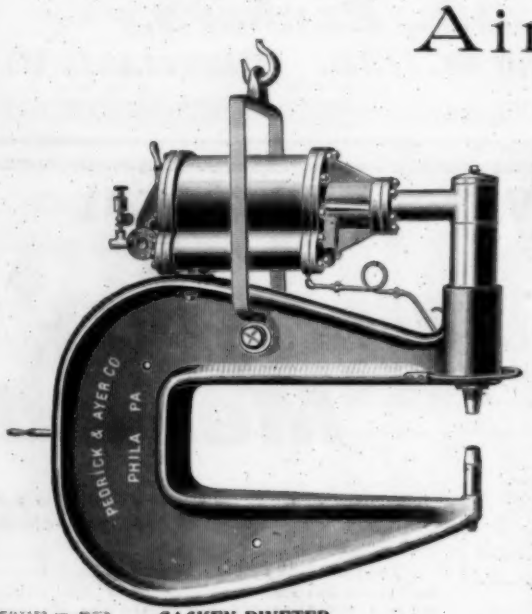

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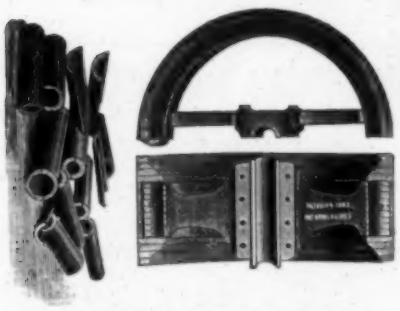

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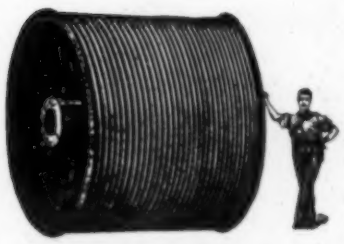

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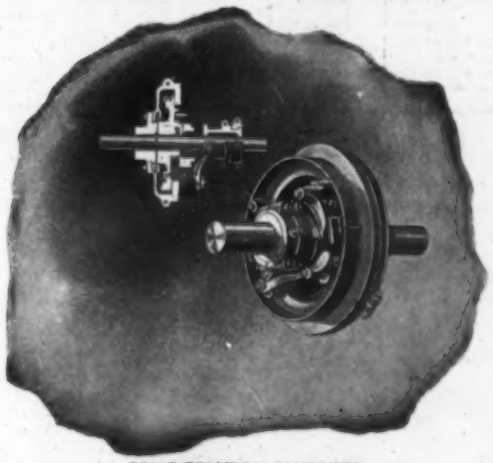

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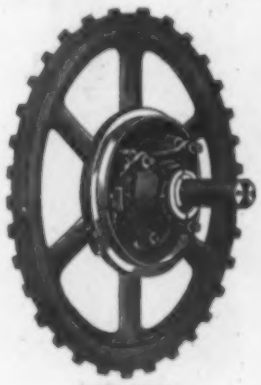

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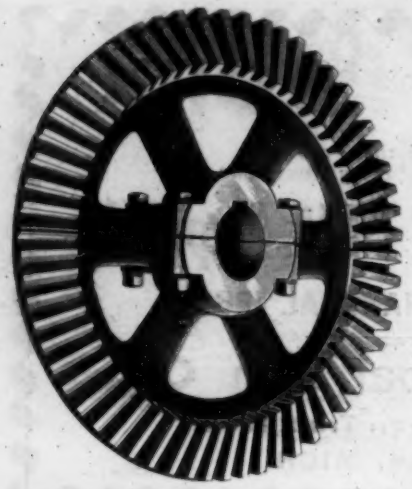

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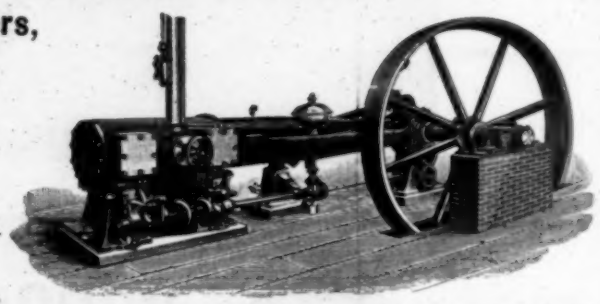

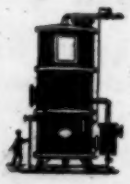

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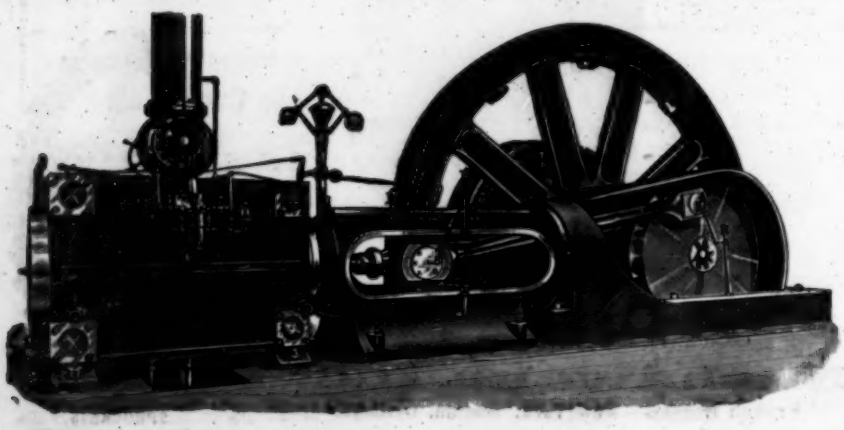

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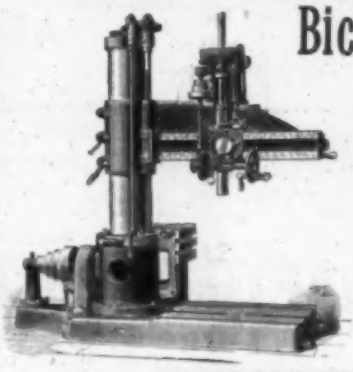

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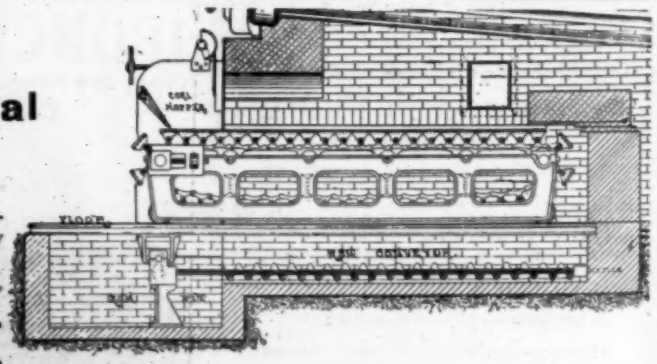

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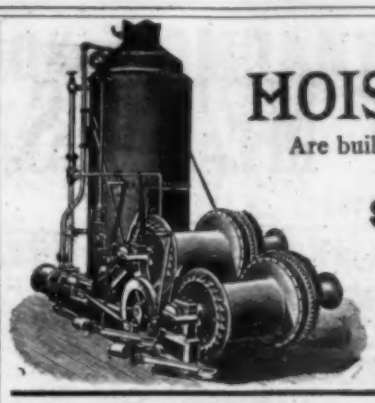

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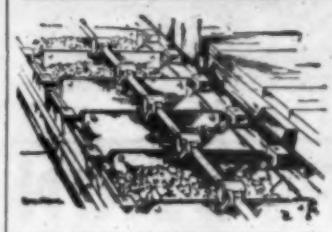

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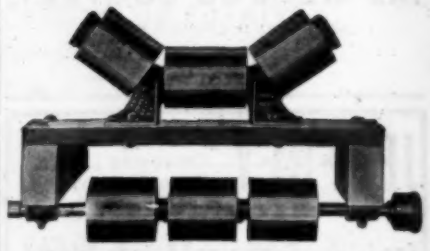

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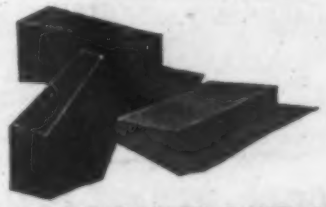

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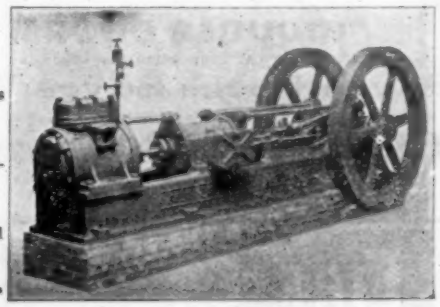

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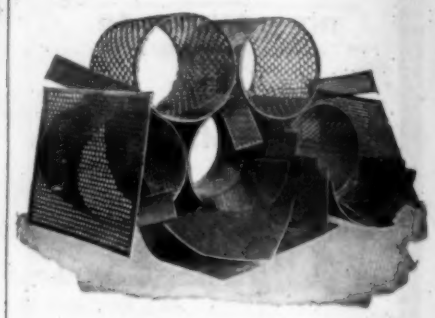

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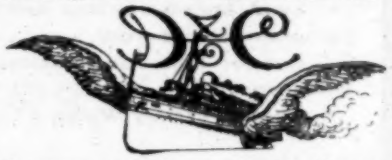

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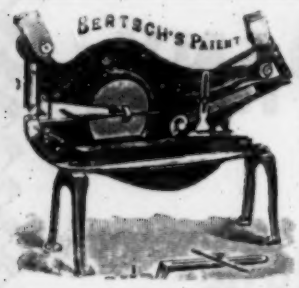

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Tools for Boiler Shops, Machine Shops and general iron manufacturing industries.

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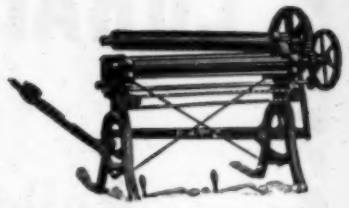

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LOOK FOR IT.

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Established 1879.

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SHIPPERS OF ALL GRADES OF

MOULDING SAND.

Our Sand is SECOND TO NONE. Banks at Conneaut and Kingsville. Samples and Prices on Application

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Molding Sand

Largest Variety in Standard Qualities.

FOR

Stove Plate, Hardware, Agricultural Work, Brass, Malleable, Machinery, Cores, etc.

Guaranteed superior in point of wear and surface to any in the market. Sold exclusively by

The Newport Sand Bank Co., Newport, Ky.

FOR SALE.

One nine-inch Mill, 5 Stands of Housings and solid Bed Plate.

Three sets steel pinions, carriages, couplers, guides, rests and caps complete.

Assortment of rolls for making flats from ⅝-in. to 3-in wide. Squares from ¼-in. to 1⅜-in. Rounds from 5-16 in. to 1⅜-in., inclusive.

Patterns complete will be sold with this Mill. Apply to

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DETROIT, MICH.

FOR RENT OR SALE.

The axle Works property at Junction of Broadway, Erie & Valley railways, Cleveland, O., including engine, boiler and shafting; or will erect on these premises buildings to suit tenant, if leased for a term of years. Address

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Canton, O.
ESTABLISHED 1854.

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CHICAGO RAWHIDE MFG. CO., 75-77 Ohio St., CHICAGO, ILL.

THE PACE THAT KILLS.

The pace that kills ordinary belting, or rather unfits it for service after a year or so of hard usage—such a pace the LEVIATHAN accomplishes year after year with but slight inroads upon its strength and vitality.

LEVIATHAN BELTING

will work anywhere without damage to its texture—in underground dampness, in the heat of the forge room, or the dirt-laden are of the Clay Manufactory.

MAIN BELTING CO.,

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Advertisers who "keep everlastingly at it" win success.
That is the testimony of the shrewdest and livest of them.

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IRON ORE.

[On Lake Erie Docks.]

Special low-phosphorus hard ore, Bessemer	$4.50
No. 1 Specular, Bessemer	$3.50@ 4.25
No. 1 Bessemer, hematite	3.00@ 4 05
Hematites No. 1 non-Bessemer	2.25@ 2.70
No. 1 Specular, non-Bessemer	2.50@ 2.75
Mesabi Bessemer	2.50@ 3.00

PIG IRON.

Cleveland (f. o. b. cars):	
Bessemer	$23.25
No 1 Strong Foundry	$21.50@ 23.00
N . 2 Strong Foundry	21.50@ 22 50
Gray Forge, red short	20.50@ 21.00
No. 1 American Scotch	22 50@ 23.00
No. 2 American Scotch	21.5 @ 22.50
Lake Superior Charcoal	24.00@ 25.00

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	Gross Tons.
Old iron rails	$24.00
Old steel rails (6 ft. and over)	18.50
Old steel rails (6 ft. and under)	19.50
Old car wheels	10.00
	Net Tons.
No. 1 R. R. wrought scrap	$19.00
Mill scrap	14 50
No. 1 Machine cast scrap	10.00
Iron axles	23.00
Axle turnings	12.00
Wrought turnings (free from cast)	10.50
Cast borings	9.50
Uncut wrought iron boilers	7.00
Steel boiler plates	12.00
Grate bars	9.00
Pipes and flues (clean)	12.50
Tank Iron	12.00
Hoop and band iron	9.00
Sheet iron	8.00
Wrought drillings	10.60
Malleable iron	13.00

STRUCTURAL MATERIAL.

Beams and channels (f. o. b. Cleveland)	2.35c
Angles	2.35@ 2.45c
Tees	2.45c
Universal plates	3.00c
Sheared plates	3.00c

MERCHANT IRON & STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares—Bar Iron.

1 to 1⅝	2.50 Base.
2 to 2⅝	.20 extra.
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4⅝	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6⅝	2.20 "
6⅝ to 7⅛	2.50 "
⅛ to ⅜	.10 "
⅜ to 11-16	.20 "
⅝ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 1-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.30 "

Flats.—Bar Iron.

1⅛ to 4 x ⅜ to 1	1.05 Base
4⅛ to 6 x ⅜ to 1	.10 extra
6⅛ to 8 x ⅜ to 1	.60 "
8⅛ to 10 x ⅜ to 1	.80 "
1⅜ to 4 x 1 1-16 to 1½	.30 "
4⅛ to 6 x 1 1-16 to 1½	.40 "
6⅛ to 8 x 1 1-16 to 1½	.60 "
8⅛ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4⅛ to 6 x 1⅝ to 2	.60 "
6⅛ to 8 x 1⅝ to 2	.80 "
8⅛ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4⅛ to 6 x 2⅛ to 3	.80 "
6⅛ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1¾ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
¾ to 15-16 x ⅜ to ⅞	.40 "
⅝ to 11-16 x ⅜ to ⅞	.50 "
⅛ to 9-16 x ⅜ to ⅞	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4⅛ to 6 x ¼ to 5-16	.30 "
1⅛ to 4 x ¼ to 5-16	.20 "
1 to 1¾ x ¼ to 5-16	.30 "
¼ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
¾ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. Bevel Edge Shaft Iron 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4⅛ to 6 x No. 9 to 3-16	.50 "
4⅛ to 6 x Nos. 10, 11 and 12	.60 "
1⅛ to 4 x No. 9 to 3-16	.40 "
1⅛ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "

7-16 to ½ x No. 9 to 3-16.....1.30 extra
7-16 to ½ x Nos. 10, 11 and 12.....1.40
⅝ x No. 9 to 3-16.....1.50
⅝ x Nos. 10, 11 and 12.....1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.....
Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1¼.....40 extra
½ to 13-16.....50 "
⅝ to 11-16.....60 "
¾ to 9-16.....80 "
⅞ to 7-16.....1.10 "
1 to 9-16 x 3-16.....1.00 "
⅞ to 11-16 x ⅛.....1.20 "

Half Oval and Half Round.

2½ to 3.....60 extra
2 to 2.....50 "
1½ to 13-16.....70 "
1⅛ to 11-16.....90 "
1 to 9-16.....1.20 "
⅞ to 7-16.....2.50 "
5-16.....3.50 "
¼.....4.50 "

Half Ovals less than ¼ their width in thickness extra price.

Horse Shoe Iron.

All sizes.....1 c. extra.
Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width in Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base. Extras.	
1½ to 6,	" 10, 11, 12 or ¼"	.05 per 100 lbs	
1 to 1½,	" 7, 8, 9 or 3-16"	.10	"
1 to 1½,	" 10, 11, 12 or ¼"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10, 11, 12 or ¼"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10, 11, 12 or ¼"	.45	"
⅝,	Nos. 7, 8, 9 or 3-16"	.55	"
⅝,	" 10, 11, 12 or ¼"	.60	"
7-16	" 7, 8, 9 or 3-16"	.75	"
7-19	" 10, 11, 12 or ¼"	.85	"
½,	" 7, 8, 9 or 3-16"	.95	"
½,	" 10, 11, 12 or ¼"	1.05	

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.		
7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base Extras.	
7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs	
7-16 to 2,	" 20	.10	"
7-16 to 2,	" 21	.15	"
7-16 to 1½,	" 22	.25	"
½ to 1½,	" 13, 14 and 15	.05	"
½ to 1½,	" 16, 17 and 18	.10	"
1¼ to 1½,	" 19 and 20	per 100 lbs.	
1¼ to 1½,	" 21	.20	"
1¼ to 1½,	" 22	.30	"
15-16 and 1,	" 13, 14 and 15		"
15-16 and 1,	" 16, 17 and 18	.15	"
15-16 and 1,	" 19 and 20	.20	"
15-16 and 1,	" 21	.25	"
15-16 and 1,	" 22	.35	"
¾,	Nos, 13, 14 and 15	.20	"
¾,	" 16, 17 and 18	.25	"
¾,	" 19 and 20	.30	"
¾,	" 21	.35	"
¾,	" 22	.45	"
¾ and 13-16	Nos. 13, 14 and 15	.30	"
¾ and 13-16	" 16, 17 and 18	.35	"
¾ and 13-16	" 19 and 20	.40	"
¾ and 13-16	" 21	.45	"
¾ and 13-16	" 22	.50	"
¾ and 13-16	" 23	.60	"
11-16,	Nos. 13, 14 and 15	.35	"
11-16,	" 16, 17 and 18	.40	"
11-16,	" 19 and 20	.50	"
11-16,	" 21	.60	"
11-16,	" 22	.70	"
11-16,	" 23	.80	"
⅝,	Nos. 13, 14 and 15	.40	"
⅝,	" 16, 17 and 18	.45	"
⅝,	" 19 and 20	.55	"
⅝,	" 21	.65	"
⅝,	" 22	.75	"
⅝,	" 23	.85	"
9-16,	" 13, 14 and 15	.45	"
9-16,	" 16, 17 and 18	.50	"
9-16,	" 19 and 20	.60	"
9-16,	" 21	.70	"
9-16,	" 22	.80	"
9-16,	" 23	.90	"
⅝,	" 13, 14 and 15	.55	"
⅝,	" 16, 17 and 18	.60	"
⅝,	" 19 and 20	.70	"
⅝,	" 21	.80	"
⅝,	" 22	.90	"
⅝,	" 23	1.00	"
7-16,	" 13, 14 and 15	.80	"
7-16,	" 16, 17 and 18	.90	"
7-16,	" 19 and 20	1.00	"
½,	" 13, 14 and 15	1.00	"
½,	" 16, 17 and 18	1.10	"
½,	" 19 and 20	1.20	"

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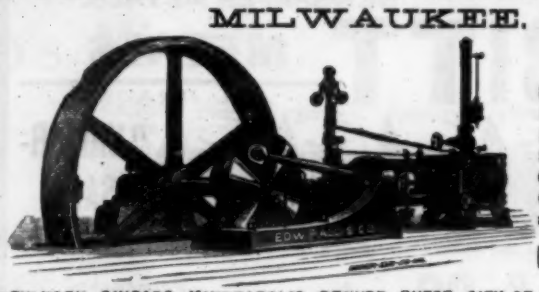

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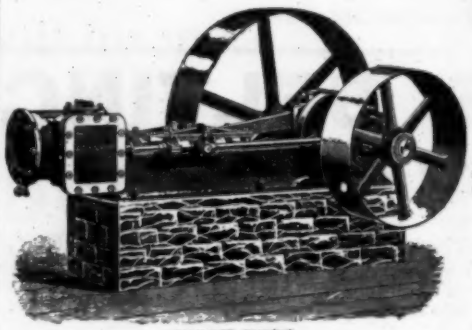

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Foundry contracts solicited for Castings from 10 lbs. to 5 tons each.

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Skinner Chuck Co., New Britain, Conn.

COAL CUTTERS—
The Ingersoll-Sergeant Drill Co., New York.
Jeffrey Mfg. Co., Columbus, O.

COAL SCREENS—
Rob't. Aitchinson Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

COAL AND COKE—
Matthew Addy & Co., Cincinnati, O.
Rogers, Brown & Co., Cincinnati, O
Reed F. Blair & Co., Pittsburg, Pa.
Forster, Waterbury & Co., Chicago, Ill.
H. C. Frick Coke Co., Pittsburg, Pa.
McKeefrey & Co., Leetonia, O.
Washington Coal and Coke Co., Pittsburg, Pa.
Pickands, Mather & Co., Cleveland, O.

COAL HANDLING MACHINERY—
Robins Conveying Belt Co., New York City.

COAL MINING MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
Webster Camp & Lane Machine Co., Akron, O.

CONVEYORS—
Jeffrey Mfg. Co., Columbus, O.
Heyl & Patterson, Pittsburg, Pa
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O.
Robins Conveying Belt Co., New York City.

COMPAROMETERS—
Vulcan Mfg. Co., Pittsburg, Pa.

COMPRESSED AIR SHOP TOOLS—
Clayton Air Compressor Works, New York City.
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.
Q & C Co., Chicago, Ill.
American Pneumatic Tool Co., New York City.
Manning, Maxwell & Moore, New York City.

COMPRESSION COUPLINGS—
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio

CONTRACTORS FOR CLEANING BOILERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

CORE OVENS—
Millett Core Oven Co., Brightwood, Mass.

CORRUGATED IRON—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O

COTTON TIES—
American Steel Hoop Co., Pittsburg, Pa.

CRANES AND DERRICKS—
Northern Engineering Works, Detroit, Mich.
Wm. Tod & Co., Youngstown, O.
Marion Steam Shovel Co., Marion, O.
Reading Crane & Hoist Works, Reading, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.
Excelsior Iron Works Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

CUPOLAS—
Riter-Conley Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.

DIES—
Danielson Machine & Tool Co., Cleveland, O.

DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

DRILL GRINDERS—
J. Wendell Cole Columbus, O.

DRILL PRESSES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield Mass.
Manning, Maxwell & Moore, New York City.
Danielson Machine & Tool Co., Cleveland, O.

DROP FORGINGS—
Wyman & Gordon, Worcester, Mass.
Chicago Drop Forge & Foundry Co., Kensington, Ill.

DROP PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
E. Konigslow & Bro., Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield, Mass.

DYNAMOS—
Jeffrey Mfg. Co., Columbus, O.

EAVE TROUGHS AND CONDUCTORS—
Berger Mfg. Co., Canton, O.

ELEVATING AND CONVEYING MACHINERY—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O
Buhl Malleable Co., Detroit, Mich.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

EMERY AND CORUNDUM WHEELS—
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besley & Co , Chicago, Ill.
J. Wendell Cole, Columbus and Chicago.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

EMERY WHEEL MACHINERY—
J Wendell Cole, M.E., Columbus,O., or Chicago
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besly & Co., Chicago, Ill.
Northampton Emery Wheel Co., Chicago. Ill.
W. P. Davis Machine Co., Rochester, N. Y.

ENGINEERS AND CONTRACTORS—
Wellman-Seaver Engineering Co., Cleveland, O.
Walter Kennedy, Pittsburg, Pa.
Heyl & Patterson, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, O
E. E. Erickson, Pittsburg, Pa.
John T. Jones & Co., Chicago, Ill.
Riter-ConleyMfg. Co., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Alex Laughlin & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.

ENGINE PACKING—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill

ENGINEERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

ENGINE LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
American Tool Works Co., Cincinnati, O.

ENGINES (OIL)—
The Aultman Co., Canton, O.

ENGINES (STEAM)—
W. P. Davis Machine Co., Rochester, N. Y
Wm. Tod & Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven Owens & Rentschler Co., Hamilton, O.
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.
I. & E Greenwald Co., Cincinnati, O.
Webster Camp & Lane Machine Co., Akron, O.,
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

ENGRAVERS AND ELECTROTYPERS—
Central Electrotype & Engraving Co., Cleveland, O.
National Engraving Co., Cleveland, O.,
Samuel R. Mason, Cleveland, O.

FEED WATER HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
We Pu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

FILES, MAKERS OF—
C. H. Besly & Co., Chicago, Ill.

FIRE BRICK AND CLAY—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
F. B. Stevens, Detroit, Mich.
Chicago Fire Clay Product Co., Chicago, Ill.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
A. F. Smith & Co., New Brighton, Pa.

FIRE PROOF COVERING—
C. H. Besly & Co., Chicago, Ill.

FLEXIBLE SHAFTS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FLUE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FORGINGS—
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Bræburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Danielson Machine & Tool Co., Cleveland, O.

FOUNDRIES—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
I. & E. Greenwald Co., Cincinnati, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Excelsior Iron Works Co., Cleveland, O.

FOUNDRY EQUIPMENT.
Miller & Hays, Akron, O.
Tabor Mfg. Co., Elizabeth, N. J.
Millett Core Oven Co., Brightwood, Mass.
Brass Founders Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
King Improved Sand Blast Co., Detroit, Mich.
Northern Engineering Works, Detroit, Mich.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.

FOUNDRY SUPPLIES—
Northern Engineering Works, Detroit, Mich.
Miller & Hays, Akron, O.
Clearfield Fire Brick Co., Clearfield, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
A. F. Smith & Co., New Brighton, Pa.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Millett Core Oven Co., Brightwood, Mass.
Cleveland Facing Mill Co., Cleveland. O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.
King Improved Sand Blast Co., Detroit, Mich.

FRICTION METAL—
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago. Ill.

FURNACES—
Playford Stoker Co., Cleveland, O.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FUEL OIL BURNERS—
W. S. Rockwell & Co., New York City.

GALVANIZED IRON—
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZERS—
Ætna-Standard Iron & Steel Co., Bridgeport, O
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAS ENGINES—
Northern Engineering Works, Detroit, Mich.

GAUGE COCKS—
James Bonar & Co., Pittsburg, Pa.

GEARING—
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GREASE—
A. F. Boettcher, Rowlands, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos Dixon Crucible Co., Jersey City, N. J.

GRATE BARS—
Geo. B. Sennett Co., Youngstown, Ohio.

GRAY IRON CASTINGS—
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.

HACK SAWS—
Millers Falls Co., New York City.
Q & C Co., Chicago, Ill.

HANGERS—
R. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HOISTS—
Reading Crane & Hoist Works, Reading, Pa.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
We Pu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Excelsior Iron Works Co., Cleveland, O

HOISTING MACHINERY—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
Excelsior Iron Works Co., Cleveland, O.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
Robins Conveying Belt Co., New York City.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.

HOTELS—
United States Hotel Co., Cleveland, O.

IMPULSE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

IRON BUILDINGS—
Shiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Co., Pittsburg, Pa.

IRON NAILS AND STEEL—
Bethlehem Steel Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
R. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

IRON WORKING TOOLS—
American Tool Works Co., Cincinnati, O.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Cleveland Ball & Screw Co., Cleveland, O.
W. P. Davis Machine Co., Rochester, N. Y.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

LADLES—
Northern Engineering Works, Detroit, Mich.

LATHES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O.

LUBRICATORS—
A. F. Boettcher, Rowlands, Pa.

MACHINISTS' TOOLS AND SUPPLIES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINE SHOPS—
The R. D. Nuttall Co., Allegheny, Pa.
H. A. Streeter, Chicago, Ill.
Danielson Machine & Tool Co., Cleveland, O.

MACHINERY AND TOOL STEEL—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.

MALLEABLE CASTINGS—
Acme Malleable Iron Works, Buffalo, N. Y.
Buhl Malleable Co., Detroit, Mich.

MANUFACTURING CHEMISTS—
We Pu Go Co., Cincinnati, O.

MANUFACTURED IRON AND STEEL—
Bourne-Fuller & Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.
Republic Iron & Steel Co., Chicago Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.

METAL BEARINGS—
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelshia, Pa.
Swarts Metal Refining Co., Chicago, Ills
F. R. Philips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

MILLING MACHINES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis,
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co, Milwaukee, Wis

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
W. S. Rockwell & Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

ORE CARS—
The Pressed Steel Co. Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers Chicago, Ill.

ORE SCREENS—
Seibel-Suesdorf Copper & Iron Mfg. Co., St. Louis, Mo.
Robt Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
C. Wilford Peters, Cincinnat O.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland O.

PERFORATED METALS—
Seibel-Suessdorf Copper & Iron Mfg. Co., St. Louis, Mo.
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.

PIG IRON—
Matthew Addy & Co., Cincinnati, O.
Rogers, Brown & Co., Cincinnati, O.
Reed F. Blair & Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill,
The Brier Hill Coal & Iron Co., Youngstown, O.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill,

PIG IRON CASTING APPARATUS—
Heyl & Patterson, Pittsburg, Pa
G. H. Ginther, Special Agent, Pittsburg, Pa.

PIPE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

PIPE COVERING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn.

PLANERS—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O.

PLATES—
Enterprise Boiler Co. Youngstown, O.
Republic Iron & Steel Co., Chcago, Ill.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York.

PNEUMATIC TOOLS—
American Pneumatic Tool Co., New York City
Q & C Co., Chicago. Ill.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
Vulcan Mfg. Co., Pittsburg, Pa.

POWER DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield Mass.

POWER PRESSES--
Bertsch & Co., Cambridge City, Ind.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

POWER TRANSMISSON MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
E. A. Delano, Chicago. Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago Ill.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.
James Bonar & Co., Pittsburg, Pa.

PULLEYS—
W. A. Jones Foundry Co., Chicago, Ill
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.

PUMPS (STEAM)—
The Edward P. Allis Co., Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin, Ill,
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.

PUNCHES—
E. Konigslow & Bro. Cleveland, O.

PYROMETERS—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

RADIAL DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.

RAILWAY SUPPLIES—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.

RIVETS—
Champion Rivet Co., Cleveland, O.
Jonse & Laughlins, Ltd., Pittsburg, Pa.

RIVETED STEEL PIPE—
The Wm. B. Pollock Co. Youngstown, O.

ROCK DRILLS—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

ROLLING MILL MACHINERY—
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa

ROOFS—
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.

SAND BLAST MACHINES—
King Improved Sand Blast Co., Detroit, Mich.

SAWS—
Peter Gerlach & Co., Cleveland, O.

SCREENS FOR COAL, ORE, ETC.—
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

SCREWS—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill

SCREW MACHINES—
Cleveland Ball & Screw Co., Cleveland, O.

SEAMLESS TUBES—
Shelby Steel Tube Co., Cleveland, O.

SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

SHAFTING—
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Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Bethlehem Steel Co., South Bethlehem, Pa.
American Steel & Wire Co., Chicago, Ill.

SHAPERS—
W. P. Davis Machine Co., Rochester, N. Y.
Baush & Harris Machine Tool Co., Springfield, Mass.
American Tool Works Co., Cincinnati, O.

SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Danielson Machine & Tool Co., Cleveland, O.

SHEET IRON—
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago. Ill.
Republic Iron & Steel Co., Chicago, Ill.

SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.

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James Bonar & Co., Pittsburg, Pa.
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Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.

STAND PIPES—
The Wm. B. Pollock Co., Youngstown, O.

STEAM BOILER INSPECTORS—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

STEAM PIPE AND BOILER COVERING—
C. H. Besly & Co., Chicago Ill

STEAM PACKING—
C. H. Besly & Co., Chicago, Ill.

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Hall Steam Pump Co., Pittsburg, Pa.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Edw. P. Allis Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

STEAM SEPARATORS—
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Austin Separator Co., Detroit, Mich.
Harrison Safety Boiler Works, Philadelphia, Pa.

STEAM SHOVELS AND DREDGES—
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The Bucyrus Co., South Milwaukee, Wis.

STEAM SPECIALTIES—
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Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Byron H. White, Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.
American Steel Hoop Co, Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.

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American Steel & Wire Co., Chicago, Ill.

STEEL BALLS—
Cleveland Ball & Screw Co., Cleveland, O.

STEEL BANDS—
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STEEL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

STEEL CASTINGS—
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Q & C Co., Chicago, Ill.
Bethlehem Steel Co., South Bethlehem, Pa.

STEEL CEILINGS—
Berger Manufacturing Co., Canton, O.

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The Riter-Conley Co., Pittsburg, Pa.

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The Lorain Steel Co., Lorain, O.
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The Aultman Co., Canton, O.

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American Tin Plate Company, Chicago, Ill.

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The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

TROLLEY TRACKS—
Northern Engineering Wotks, Detroit, Mich.
Miller & Hays, Akron, O.

TRUCKS—
Northern Engineering Works, Detroit, Mich.

TUBES—
National Tube Works, McKeesport, Pa.
Shelby Steel Tube Co., Cleveland, O.
S. Fix' Sons, Cleveland, O.

TUBE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

TUBE WELDING—
S. Fix Sons, Cleveland, O.

TUMBLERS—
Northern Engineering Works, Detroit, Mich.

TURNBUCKLES—
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The Ironsides Company, Columbus, O.

WIRE FENCING—
American Steel & Wire Co., Chicago, Ill.

WIRE FILLER—
The Ironsides Company, Columbus, O.

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WIRE NAILS—
American Steel & Wire Co., Chicago, Ill.

WIRE ROPE COATING—
The Ironsides Company, Columbus, O.

WIRE ROPE FILLING—
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WOOD PULLEYS—
Dodge Mfg. Co., Mishawaka, Ind.

WROUGHT PIPE—
National Tube Works, McKeesport, Pa.

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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Webster Fire Brick Co	1
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THE TOTTEN & HOGG IRON & STEEL FOUNDRY CO.
OFFICE & WORKS
24TH ST. & A.V.R.R.
PITTSBURGH, PA.
PINIONS, CHILLED & SAND ROLLS.
ROCK CRUSHERS
ROLLING MILL & TIN PLATE MILL MACHINERY

Tin Plate Mills and Machinery

ROLLING MILL MACHINERY, CHILLED AND SAND ROLLS.

"ZERO" Highest grade Anti-Friction Metal. Estimates given on complete plants.

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THE LORAIN FOUNDRY COMPANY,

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SAND AND CHILLED ROLLS.

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THOUSAND LITTLE

TROUBLES

of the engineer resulting from impurities in the Exhaust and moisture in live steam, not to mention the more important breakages from the same clause, that cost time and money to repair.

These are the things that are obviated by the use of the

AUSTIN SEPARATORS.

Our catalogue will interest you

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STEEL CASTINGS.

We are thoroughly equipped to meet all Specifications.

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Hydraulic Pressed Forging.

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There is a vast deal in familiarity with the type and phrase in which a manufacturer makes himself known to the advertisement reader, just as the personal acquaintance of his traveling salesman gets him a hearing when a strange face and a strange voice are bowed out with a "busy day's" courtesies.

The best advertisers, the most successful advertisers, the advertisers who get returns, are those who keep everlastingly at it.

This is a case in which familiarity breeds business.

Now is the time for you to spread out.

Extend your business and create a demand for your devices in new fields.

The man who whispers down a well,
About the things he has to sell,
Won't reap the golden dollars,
Like one who climbs a tree and—hollers.—Ex.

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Has the largest paid circulation in its territory.

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Spearman Iron Company,

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Inspected Foundry Irons. Softness, Strength, Fluidity, Uniformity.

American Scotch

brand unequaled.

HENDERSON & TRAGO, Agents,
CLEVELAND, O.

Absolutely without a rival.

Perfect Lubricating Metal.

The only Phosphorized Tin Graphite Bearing Metal in the world. Write for particulars. Ask your dealers for it.

Perfect Lubricating Metal Co.,
Second and Plum Sts.,
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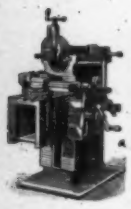

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DEALERS IN

MACHINERY and Machine Tools

MANUFACTURERS OF

DIES,

Special Machinery, Etc.

Special Department for **DEVELOPING INVENTIONS** in SECRET.

A full line of **NEW and SECOND HAND PRESSES and MACHINE TOOLS** carried in stock

93 to 97 Lake St., Cleveland, O.

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That Foreign Machine Works are preparing to meet American competition is shown by the number of recent orders for

THE SELLER'S TOOL GRINDERS and DRILL GRINDERS.

"A word to the wise is sufficient." Write to

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P. O. Box 486, CHICAGO. P. O. Box 84, COLUMBUS, O.,
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Radial Drills,

FOR EVERY CLASS OF WORK. 1899 Catalog Describes Them.

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The Best Boiler for Utilizing Waste Gases Around Blast Furnaces and Rolling Mills.

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THE MEEHAN BOILER & CONSTUCTION CO.,
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The "ORIGINAL GANDY"
Stitched Cotton Duck Belting,

Especially adapted for Main Drivers, Saw Mills, Cotton Gins, Cotton Presses, and for all places where belts are subjected to moisture or atmospheric changes, the "GANDY" stands paramount.

For further information, prices, etc., write

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FOR

Iron Mining.

We have machines of new designs with hoisting, swinging and crane engines. These were designed and constructed especially to meet requirements of iron mining and coal mining fields.

WE INVITE MOST RIGID INVESTICATION.

For full information address

THE

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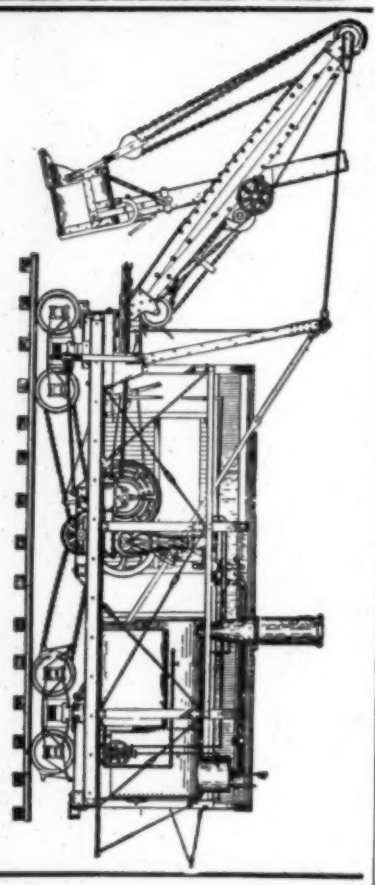
Marion, Ohio.



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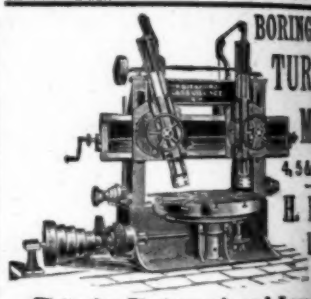

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